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FIRST ANNUAL REPORT

OF THE

GEOLOGICAL AND AGRICULTURAL

SURVEY OF TEXAS,

— BY —

S. B. BUCKLEY, A. M., PH. D.,

STATE GEOLOGIST.

Corresponding member of the Academy of Natural Sciences of Philadelphia ;
of the Lyceum of Natural History of New York ; of the Buffalo Natural History Society ; of the Academy of Natural Sciences,
Chicago ; of the New Orleans Academy of Sciences ;
of the Cincinnati Entomological Society, etc.

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A. C. GRAY, STATE PRINTER.
1874.

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FIRST ANNUAL REPORT

OF THE

STATE GEOLOGIST.

To His Excellency Richard Coke,
Governor of Texas:

The following report of the geological and agricultural survey of the State is respectfully submitted to your consideration. Here permit me to tender you my sincere thanks for the aid and encouragement you have given me in the prosecution of the work.

I have the honor to be, with great respect,
Your obedient servant.
S. B. BUCKLEY,
State Geologist.

PREFACE.

Before my arrival at Austin this fall from the field work of the survey, I supposed this report would not be wanted until the meeting of the Legislature in January; but on the contrary, it has to be printed before that time. The time for writing the report being so short—little more than four weeks—I determined to condense as much as possible, by merely grouping together the most useful information and leave the details for a future time.

I have studied to make it useful for the people, and hence avoided scientific terms as much as possible. I have endeavored to describe things as they really are, and I certainly represent them just as I think them to be. At my request, Prof. Burleson, my First Assistant, has prepared a report of things as he saw them. This report I did not receive until mine was nearly done, and I did not read it until after mine was finished. I had intended to give a short account of each county, but such accounts would have much of sameness. The accounts of the geology, and of the soils of the different geological periods, give the main features of the country passed over by the survey this season, including also what I had seen previously when connected with the survey.

IMPORTANCE OF THE SURVEY.

To many it may seem unnecessary to say anything on the utility of a geological and agricultural survey, because such surveys have already been tested and found to be of great practical value by most civilized countries. Indeed it is impossible to develop the mineral and agricultural resources of a State in an economical manner without such a survey. Hence the capitalist and the emigrant consider a geological and agricultural report, made by the authority of a State, the most reliable as regards its mineral and agricultural wealth. The capitalist wants to know about the coal, iron, copper, and other mineral wealth of the State; also, its soil and agricultural capacity, that he may know best where to build railroads and start manufactories; and the emigrant also wants to know about these things, that he may decide best where to locate with regard to his particular vocation. The Geological Department has many letters from representative men of those classes asking for information, and for geological and agricultural reports of the State. Only let Texas be known abroad as she really is, and there will be enough of immigration.

More than enough time and money has already been spent in Texas in searching and digging after minerals, where it is useless to look after them, than would be sufficient to defray the expenses of its geological survey. One of the most useful parts of a survey is the directing where to look and where not to look after minerals, and thus preventing useless expenditure. There are few counties in the State which have not had their mineral hunters—gold, silver and lead being the things most sought. In 1867 an expedition of about one hundred men started from Georgetown, in Williamson county, to take possession of large deposits of gold, which were said to be on the Pecos, near the route from Fredericksburg to El Paso. Gold in large lumps and in the greatest abundance was reported by two men to be there. They had seen it, and knew it to be so. The party spent the summer, a large portion going through to El Paso, where they disbanded; some returning in squads, others going into Mexico. Nothing of value was found, nor did any of the party understand mineralogy or geology; hence, iron pyrites, sulphuret of copper, and yellow mica were mistaken for gold, and silver mica, etc., for silver, specimens of these being brought back by some, and sent to me for examination.

When at Jefferson, last summer, I read in a newspaper of rich silver mines having just been found at the Gordon Mountain, in Montague county; a large vein of silver was said to extend over and through the mountain. I met a young man who said he belonged to a party of twelve, who were going to start next week to get silver in Montague county. From Northern Texas many went to the Gordon Mountain after silver.

To see about this, we went there last September, but before getting to the spot, we were convinced there was no silver there, because the formation was the lower cretaceous abounding in fossils, being a sedimentary deposit formed gradually in the sea, and barren of silver; but on we went, and encamped at the foot of the mountain. In its side, high up, men had dug several days, mistaking probably a thin seam containing small crystals of selenite, a form of gypsum, for a vein of silver. We could see nothing else resembling silver, excepting a few grains of sand.

Instances of a similar nature could be multiplied into many pages. None of the mining companies in the rich mining States among the Rocky Mountains, venture to begin work before suitable geological examinations have been made. Hence mining, as it is now generally conducted on scientific principles, is much more reliable than it was a few years ago. This result has been brought about by the enormous sums which have been spent by individuals and companies in fruitless mining operations.

The survey, if properly conducted, will make known the agricultural capacity and adaptation of the soil for particular crops, and disseminate information as to the best modes of cultivating the different grains, grasses, cotton, sugar, tobacco, fruits, etc., for Texas is so extensive that she has a climate and soil suited to a more varied agriculture than any other State east of the Rocky Mountains. Within the last thirty years, the great progress and general diffusion of agricultural chemistry in Great Britain, and also, in the older States of this country, has more than doubled the amount per acre of their agricultural productions, and more than tripled the value of their lands. We were often told this summer that such and such lands in Texas had borne annual crops for twenty years, or more, without any diminution of their yield. The truth is, land can bear annual crops, and the last crop be better than the first. It is so with many of the lands of Europe, and of the older States of this country. This has been accomplished by giving the soil more plant food than has been taken from it by the growing plants.

I believe the most speedy and economical way of protecting the frontier, is to make known its mineral wealth and agricultural capacity; then the tide of emigration westward will be such as to stop the incursions of the Indians.

HISTORY OF THE SURVEY.

In 1849, there was published at Bonn, in Germany, "Texas, with Observations on its Natural History and Geology," accompanied with a topographical and geological map of the country, by Ferdinand Roemer, and in 1852, by the same author, was published a notice of the cretaceous rocks of Texas, with descriptions of new species, illustrated with plates. This last work is almost indispensable to the student of Texas geology. Both of these works are in German.

The report of Capt. R. B. Marcy, on the exploration of the Red River, of Louisiana, was published at Washington, in 1853. In this work are notices of the coal fields of Fort Belknap, the gypsum on the upper Red River; also, specimens of copper are reported to have been found in that region.

The "Geology of North America," by Prof. Jules Marcou, was published in 1858. In this work a chapter is given to the geology of the country between Preston, on the Red River, and El Paso, on the Rio Grande. Here again the coal field of Fort Belknap is mentioned, also the gypsum and salt of north-western Texas, but no allusion to the copper is made.

Marcou's observations were founded on specimens given him by Capt. John Pope, of the United States army, collected by his expedition through that region, which was not visited by Marcou.

The geological map of Marcou is far from giving a correct delineation of the geological periods of Texas.

The report of the Mexican boundary survey, embracing reports of the natural history of the region traversed by the surveying party, was published at Washington, in 1859, in two large volumes, with numerous illustrations. The first volume contains a notice of the country along the Rio Grande, and descriptions of the fossils collected, with geological notes by the well known paleontologists, Messrs. Conrad & Hall. Neither of these gentlemen were ever in that region, hence their report is based on notes and specimens submitted to them.

A few years previous to this period, the importance of having a geological survey of Texas was urged by some of the newspapers of the State, among the foremost of which was the Houston Telegraph, edited by Dr. Francis Moore, who had, in the meantime, published several articles on the geology of the State, in the Texas Almanac.

The Legislature of 1858 passed a law authorizing a geological and agricultural survey of the State, to be made by a State Geologist, an Assistant State Geologist, and a chemist. The salary of the first was three thousand dollars a year, and of the two last, each fifteen hundred dollars. Dr. B. F. Shumard was appointed State Geologist, and he appointed his brother, Dr. Geo. B. Shumard, his first assistant, and Dr. Riddell, chemist, all of whom are said to have been installed in office in November, 1858.

First, the State Geologist went to New York and bought apparatus for an outfit, also chemicals.

In 1859, the counties of Caldwell, Comal, Hays, McLennan and Rusk were examined, the work being mostly done by the assistants, the chemist being also in the field.

The State Geologist made a partial reconnoisance of southern and eastern Texas. Late in the autumn a hasty trip to Fort Belknap was made by all the party. Then the State Geologist made his first and only report to the Legislature in an octavo pamphlet of seventeen pages. It merely alludes to the counties examined, and gives a short account of the coal field at Fort Belknap. No copy of this is in the State Library. Few persons in Texas knew that Dr. Shumard made any report. Not having seen it, I only give its contents from hearsay.

About six months of Dr. Shumard's first year in the Texas survey was given by him to a description of the fossils of the Missouri and Oregon surveys, he having been an assistant in the Missouri State survey at the time he received the appointment of State Geologist of Texas. The draftsman, A. R. Roesler, whom he had employed for the Texas survey at $75 00 per month, made drawings of these Missouri fossils, for which purpose he was kept at Austin a large portion of 1859.

In January, 1860, I was also employed as an assistant by Dr. Shumard, I having charge of the botanical department, also making geological observations.

In May, 1860, Drs. Shumard, Riddell and myself went, via San Antonio, to Corpus Christi, returning by way of Goliad and Lockhart to Austin. About the first of June we started for the survey of Navarro county, which was finished about the first of July; then we removed, spending the month of July in the survey of Washington county. The month of August was employed in the examination of Bastrop county. Thence returning to Austin, we went into San Saba, remaining there until November.

Dr. George G. Shumard spent the summer in northern Texas, in Grayson, Lamar, Fannin, and other counties on the Red River. He returned to Austin in September.

During the summer, Dr. B. F. Shumard had been a large portion of the time at Austin, leaving Dr. Riddell and myself in the field. At Austin he was closely watched by Gov. Houston, who, being convinced that Dr. Shumard was not a suitable person for a State Geologist, removed him about the first of November, 1860, and appointed Dr. Francis Moore, of Houston, State Geologist.

On our return from San Saba, in November, I was appointed First Assistant State Geologist by Dr. Moore, and Dr. Riddell retained as chemist, he being left in the laboratory at Austin during Dr. Moore's term of office.

Early in December, 1860, Dr. Moore and myself went southward, through Washington, Fayette, Wharton and Fort Bend counties, to the coast near Brazoria.

Returning in January, we found Dr. Shumard still at Austin, occupying his former room at the Geological Department. Dr. M. thought it rather strange that Shumard had not vacated the office. In excuse, Dr. S. assured Dr.

M. that he would do nothing which would injure the interests of Dr. Moore, and that he only wished to arrange his business and start for the North. Thus assured, we started for Llano county, but on our route Dr. M. thinking that all might not go right at Austin, where the Convention of 1861 was then in session, requested me to return and arrange specimens, and watch Dr. Shumard, with whom I was then on very friendly terms. Soon after my arrival at Austin, a friend informed me that Dr. Shumard was busily engaged in persuading the members of the Convention to displace Dr. Moore, and reinstate him in office again, and that, too, with every prospect of success. To thwart this, I drew up some charges against Dr. Shumard, and placed them in the hands of Gov. Houston, who showed them to some of the leading members of the Convention, and nothing farther was done in favor of Dr. S., who, soon after, left for St. Louis, vowing vengeance, saying that he would break down my scientific reputation. Hence he wrote the letter which has been published, and used by many against me. There is not one word of truth in said letter as regards me. I studied geology and mineralogy at the Wesleyan University of Middletown, Conn., where I was noted for proficiency in these sciences, as is well known to Dr. Wm. Halsey, late President of Soule University, at Chappell Hill, in this State, who was my classmate, and who now lives at Harrisburg, near Houston; also, to Dr. John W. Foster, late President of the American Association of Science, and President of the Academy of Sciences, at Chicago, who was my fellow student; also, Prof. Richard Burleson, of the Waco University, who remembers distinctly Dr. Shumard's speaking in the highest terms of my scientific ability, when we were in the survey of Washington county in 1860; also, from a letter of Shumard's now in my possession, written in 1860, in which he calls me an "able naturalist."

I would not allude to these things had not the Shumard letter been republished in part by some of the Texas newspapers this summer, while I was engaged in the field work of the survey; hence, I consider it a duty which I owe to the people of the State, to my family and myself, to prove its falseness.

As regards the criticisms of Dr. Asa Gray of my botanical publications in the proceedings of the Academy of Natural Sciences of Philadelphia, I admit I made errors in describing some species which had already been described, and he and other botanical authors have often done the same. I certainly did not commit as great a blunder as he, when he referred specimens of my genus Hoopesia to three different species and two different genera. See Appendix.

The charges against Shumard were that he had devoted a large portion of his time, and also the time of a draftsman, in the description and delineation of the fossils of the Missouri survey; also of the Oregon survey, and while thus engaged in foreign work, they received pay from Texas.

Also, that he had exceeded the appropriation for the survey, he having, in two years, expended $28,000, when $20,000 only were appropriated.

He also complained that time had not been allowed him to prepare a report, when his own note-books showed that more than half of his time had been spent at Austin.

He also proposed to sell to other parties Texas minerals and fossils—things which belonged to the State—not to him.

Moreover, Dr. Shumard did not manage rightly. He was in office two years, with ample means for all the departments of the survey, yet he did little or nothing to develop the mineral resources of the State, or improve its agriculture. Impressed with the notion that all tertiary coals were of little use, he paid no attention to them. His chief end and aim was to discover and describe new species of fossils. To this end he gave most of his energies, unmindful of the fact that these things are only of secondary importance to the people of the State. He had not the advantages of a classical education, was a poor mineralogist, and had little knowledge of the other departments of natural history. During his two years of office not a soil was analyzed, and but very few minerals. Nor has the State any of the maps or drawings of the draftsman for the same period.

Dr. Moore and myself started early in March, 1861, on a tour through Western Texas, going through Llano, Burnet and Lampasas counties; we went north through Hamilton, Bosque, Hood and Parker, to Fort Belknap, in Young county, continuing onward and northward through Archer into Clay county as far as a few miles beyond the Little Wichita; returning southward through Stephens, Callahan, Coleman, McCulloch and Mason, thence westward to old Fort San Saba, in Menard county, and back by way of Fredericksburg, arriving at Austin about the middle of June, and found that the survey had been suspended by the Legislature on the 18th of the preceding April.

Dr. Moore had much energy, was a pretty good mineralogist, and he did more to make known the resources of the State during his short time of office than was done by Shumard in two years. The result, in part, of Dr. Moore's labors in the survey are embodied in the report of the writer, published by the Legislature of 1866. Dr. M. went North in July, 1861, and in 1864, while in the employ of a Lake Superior mining company, in the northern part of Michigan, he died. His remains were brought to New York and buried in Greenwood Cemetery. Dr. M. was an old citizen of Texas, and devoted the best energies of a long life to the advancement and improvement of his adopted State.

The result of the labors of Dr. Riddell in the laboratory, during the term of office of Dr. Moore, I have not seen. Mr. Roesler was also continued as draftsman by Dr. Moore, but none of his drawings of maps or scenes are now in the Geological Department.

Early in January of 1866 I arrived in Austin, for the purpose of renewing the geological survey, found the specimens of the State collection in heaps, covered with dust, their labels displaced, and the most beautiful ones missing. The geological rooms during the war had been used for the purpose of manufacturing percussion caps. With much hard work I succeeded in getting the specimens into their natural groups and geological periods. This accomplished, I wrote a preliminary report of what had been done in the survey, which was published by order of the Legislature of 1866, as before stated.

At the adjournment of the Legislature of 1866, in November, I was appointed by Gov. Throckmorton to take charge of the survey and rearrange the specimens in the Capitol. In March, 1867, I went, at the suggestion of Gov. Throckmorton, with Dr. Gideon Lincecum, to Milam, Bell and other counties. We examined the coal in the eastern part of Milam county. Owing to wet weather the roads were such that I left Dr. Lincecum, with his hack, on the west side of the Brazos, and went on foot through Robertson, Leon, Limestone and Falls county, where, at the falls of the Brazos, I rejoined the party of Dr. Lincecum.

Thence we passed southward through Bell county, and back to Austin about the middle of May. Soon after I wen through a portion of Burnet and Llano counties. At th request of Gov. Throckmorton, I prepared a report of wha I had done under his administration. This was left in th hands of the reconstructionists and never published. Its most important matter is in the present report. Under military rule the survey was suspended.

In 1870 a notice of Texas geology, by A. R. Roesler appeared in some of the Texas newspapers, copied from an European journal, where it had first been published. On reading this, I found that a large portion of it had bee taken almost verbatim from my report of 1866. I published a notice of said article, stating that it was a very remarkable confirmation of the accuracy of my report, th measurements of the section of Comanche Peak and o the iron hill of Llano county being exactly alike in every figure; also the fossils at Comanche Peak were the same without any addition or diminution. This might lead som to think that one or the other of the publications was a plagiarism.

Roesler replied, admitting the similarity of the two publications, also stating that instead of his having used my report, that he had never read it, and further, that his publication had been made in the Vienna Journal at Austria in Europe, in 1859. Here we joined issue. I immediately wrote to Prof. Cope, Corresponding Secretary of th Academy of Natural Sciences at Philadelphia, requesting him to examine the volumes of the Vienna Journal in thei library and ascertain the date of Roesler's publication. He did so, and found it to be either 1868 or 1869, (I have forgotten which), instead of 1859. This placed Roesler in a very unpleasant and dishonorable position.

It is due to the intelligence of the people of Texas to state that Mr. Roesler has never been employed by th State authorities as a geologist, nor has he ever added anything of importance to the geological knowledge of th State. While employed as draftsman of the survey, he was never supposed to understand geology in the least, nor was he ever requested to make independent geological examinations. Knowing that this Roesler has caused th Shumard letter to be republished, let me state that, when he did it, he knew said letter to be false, as I can prove from a letter of his (Roesler's) to me when he was in th

General Land Office at Washington. In this letter he states that my reply to the Shumard letter is a complete vindication of my scientific reputation. I had replied to the Shumard letter in the State Gazette at Austin, in 1867. This is what Roesler alluded to.

In March, 1874, Col. J. T. Brady, of Houston, informed Governor Coke and myself that, when he was in Washington, in December 1867, he saw in the possession of Roesler a large number of maps of Texas counties, also, drawings of scenes in Texas, which were made when Roesler was employed as draftsman for the State geological survey. Col. Brady inquired if these things did not belong to Texas, and Roesler replied that he kept them because the State of Texas had not paid him for his services, but the books in the State Department show that Roesler has been paid in full. By request of Gov. Coke I wrote to Roesler, demanding these things, and received from Roesler a contemptuous reply, nothing more.

In February, 1873, Gov. Davis appointed John W. Glenn State Geologist. Col. Glenn remained at Austin most of the time, until the 15th of November, when he started into the field with Charles E. Hall, his First Assistant. They went into Burnet, Llano and San Saba counties, from whence they returned about the middle of January, 1874. No report of what was done has been published. Mr. Hall, who was with me in the early summer, states that little of importance, as regards the mineral resources of the State, was accomplished.

Col. Glenn resigned, and I was appointed by Gov. Coke State Geologist, on the 6th of March, 1874. The result of the work of the survey since then is in the following report.

THE STATE COLLECTION.

The specimens were arranged in natural groups in an upper room at the capitol, in 1867, since which time they have been very much disarranged, and, what is more unfortunate, many of the best specimens have been taken away; when, or by whom, I cannot tell. Col. Glenn told me that he thought several boxes of specimens had been taken away when the State was under military rule. Be this as it may, I only know that many of the best specimens of the old collection are not now in the cabinet.

We have not attempted to re-arrange the cabinet, because there are not cases enough to properly do it; moreover, the entire room is not sufficiently large for a State collection, especially such a large State as Texas. A separate building is needed for this purpose; a small portion of this for a chemical laboratory, and the remainder for specimens. A botanical and zoological department can be added to the survey with comparatively little additional cost. The botanist can test the strength of the different woods of the State, and ascertain, as far as possible, their durability; tell us of our best grasses for hay and pasturage, and about the most useful plants, making collections of all these for the State Museum, where, if a full collection of specimens of the mineral, geological, vegetable and animal productions of the State are arranged, and shown, it will be one of the most useful and attractive places of resort at the South. There a person could, in a few hours, learn more about Texas than he would in months of travel. It will be a pleasant and instructive place of resort to both old and young. The old capitals of Europe are noted for their splendid and extensive museums of natural history, imitations of which are now being made in the principal cities of the United States. Let Texas join them in this good and noble work. She has material for a larger, better, and more attractive collection, than any State in the Union.

Such a museum here would draw more capital and people to the State, than would pay the expense of making it.

HOW A GEOLOGICAL SURVEY IS MADE.

That the management of a geological survey is not well understood by many, is shown from the numerous applications made to this department for situations, from surveyors and topographical engineers. Some have applied for the purpose of carrying a surveyor's chain. The geologist does not survey a region with compass and chain. He merely examines the strata of rocks, the soils, and general features of the country, making notes of its natural productions, its climate, etc. From the fossils, which are the animal and vegetable remains in the rocks, he ascertains their geological age and position with regard to the other rocks of the country, from which he infers, whether or not they are productive of minerals, and, if so, the nature of those minerals. To arrive at these inferences, he also observes the lithological character of the rocks.

It is the work of the geologist to read the ancient and modern records of the changes of the earth in times past. Even the most casual observer cannot fail to see that the earth of to-day is different from that of yesterday; the earth of this year is still more different from that of last year, and the earth of this century from that of thousands of years ago. Sea shells, imbedded in the rocks of our hills and mountains, teach us that Texas was once beneath the ocean. A careful study will also show that some parts of the State were dry land, while others were under the sea. Those parts which have been the longest dry land, are termed the oldest; for, strictly speaking, no part is older than the other, for matter is eternal, and what we call new and young is only old matter in a new form.

REPORT.

As this report is intended for the general reader, we give below a synopsis of the principal geological periods already known in Texas, omiting their subdivisions:

Age of Man—or Recent and Past.

Cenozoic	Tertiary.
	Tertiary.
Mesozoic	Cretacious.
	Jurassic.
Paleozoic	Permian.
	Carboniferous.
	Sub-carboniferous.
	Devonian.
	Upper Silurian.
	Lower Silurian.
	Laurentian.
	Azoic.

The Azoic are igneous rocks, destitute of animal and vegetable matter, thrown up from below, or rocks altered by contact with such melted matter. These last are termed metamorphic rocks. Gneiss, mica schist, etc., are examples of the latter, and granite and its associated crystaline rocks of the former. The metamorphic rocks may have had fossils, which have been destroyed by heat.

Some of the azoic rocks are the oldest known, and othe not, for there are granites in Texas, in Burnet, Llano an San Saba counties, which have been thrown up during th formation of the rocks of the older Silurian. At the bas of the preceding diagram, life began in Texas, from whic extending upwards, there has been a regular progressio until the present time. Life also began in many oth countries at the same period. The details of its progressio from then till now are given in geological works.

WORK DONE IN THE SURVEY THE PAST SEASON.

Just one week (eleventh of May) after the adjournme of the Legislature, we started in the field work of the su vey, with Charles E. Hall as sub-assistant, Friench Sim son and Jack Coke as amateurs, going without wages t see and learn and help in the work; James E. Horn, boo keeper and commissary; Wm. D. Carrington, Ed. Shand and one other person made the party.

As we could not start or buy an outfit until an appr priation was made, and as such appropriation was onl made on the eve of the adjournment of the Legislature, i will be seen that we were quick and prompt to begin th work.

Our trip during the summer has only been a general r connoisance, or partial survey of the following countie Burleson, Milam, Robertson, Limestone, Leon, Housto Anderson, Cherokee, Nacogdoches, Rusk, Smith, Hende son, Van Zandt, Kaufman, Rockwall, Upshur, Harriso Marion, Dallas, Collin, Grayson, Fannin, Lamar, Tarran Parker, Wise, Cooke, Montague, Clay, Jack, Youn Wichita, Throckmorton, Stephens, Shackleford, Ha kell, Jones, Callahan, Coleman, Brown, Lampasas, Sa Saba, Llano, Burnet and Williamson counties.

No detailed surveys have been made, the object bein merely to ascertain the leading geological, mineralogic and agricultural features of the counties visited, as a guid to future examinations, and aid to the capitalist and imm grant. Our party were kindly received by the inhabitan of these counties, who often gave us material assistanc for which we can only give them our thanks. To the fo lowing persons we were indebted for special favors: M T. C. Glass, Mr. Herndon and Dr. Morrow, of Calve also, to Mr. Brown, of the *Texas Farm and Home*, of th same place; Messrs. Roberts and Moore, of Bremond; (Esquire Moore traveled with us for several days and gave us much valuable information;) Senator W. D. Wood and Col. J. W. Durant, of Leon county; Dr. Hunter and Col. Word, of Palestine; Capt. James Eastland, of Anderson county; Senator J. E. Dillard, Mr. T. L. Philleo, Esquire Ragsdale and Dr. Yoakum, of Cherokee county; Senator W. H. Swift and Mr. R. W. McLain, of Nacogdoches county; Senator Web. Flanagan, of Rusk county; Mr. Wm. Anderson and Geo. A. Kelley, of Jefferson; Hon. J. W. Lane, Mr. Dodge, Mr. J. O. Crutchfield and Ammon Burr, of Dallas; Mr. Sam. Long and Col. Wilkins, of Lamar; Senator R. D. Allison and Dr. G. A. Foote, of McKinney; Senator Trollinger, of Grayson; Messrs. Lawrance, Cetti and Brewer, of Fort Worth; Capt. A. B. Gant, of Weatherford; Colonels Stratton and Whaley, of Clay county; Messrs. Graham and Medlan, of Young county; Stribbling & Co., Fort Griffin; Judge Brown, of Brownwood; Dr. C. S. Smith, Mr. Wells and Mr. Holden, of Llano county.

IRON ORES OF THE TERRITORY.

These abound in Eastern and Central Texas; also in the northwest part of Grayson county and the upper cross-timbers.

ORES OF ROBERTSON AMD MILAM COUNTIES.

About five miles east of Calvert, in the bed of Mud Creek, and in the hills in its vicinity, on lands belonging to the Hon. Mr. Barziza, and also on property belonging to Messrs. Wood & Glass. These ores are limonites, or brown oxide of iron. Some are of the honeycomb variety, valued by iron manufacturers for being easily smelted. These ores appear to be in large beds and sufficiently abundant for the manufacture of iron. Similar ores abound on the tops of hills and hillsides on the west side of the Brazos river, in Milam county, and opposite the Herndon coal-bed in Robertson county. The County Surveyor of Milam county told us that he had sent specimens of these iron ores to a chemist in Nashville, Tennessee, who reported sixty-five per cent. of metallic iron. Judging from specimens, it is probable that from forty-five to fifty per cent. of metallic iron would be their average yield from the furnace. Limestones for fluxes are in Milam county; also in Limestone county northward on the Central Railroad. Timber and coal both abound in Robertson and Milam.

Cherokee county has immense beds of iron ore. The hills around and in the vicinity of Young's Iron Works, on the International Railroad, about eight miles southwest from Jacksonville, and three miles from the Neches river, abound in first-class iron ores, of both the red and brown hematites. These works were in operation during the war, but the death of the enterprising proprietor, soon after the close of the war, caused them to be suspended. Their location is very pleasant, on an eminence amid trees, at clear springs of good water. The forge or smelting furnace is thirty-four feet square and thirty-four feet high, built in the most substantial manner of the best reddish brown sand rock—a rock peculiar to Central and Eastern Texas—at a cost of between $6000 and $7000. Ore, more than can be used for many centuries, lies in beds in the adjacent hills, and also scattered in loose masses over the surface of the country. Lime of the best quality about eighteen miles distant. This would have to be hauled by teams, as it is not on the line of the railroad. Pine and other timber very abundant on the surrounding hills. These hills or small mountains, composed mostly of sandstones and iron ores, are nearly, and perhaps entirely, the highest in Eastern Texas.

Young's Iron Works, on account of railroad and other facilities, offer peculiar and superior advantages for smelting purposes, and also for the manufacture of all manner of iron ware, to which may be added agricultural implements—the ash, oak and other wood, not far distant, being excellent for their wood work.

South of Rusk, about eight miles, amid pine-clad hills, and at a perrenial stream of clear water, is Philias Iron Works, where ore was smelted on a large scale during the war, at the close of which the smelting was suspended, and only the foundry business continued; hence the works now are in a very dilapidated and decaying condition. The only drawback to the profitable manufacture of iron here is the want of better transportation than that offered by wagons. Here the ores are good, convenient, and in inexhaustible quantities, at least for the next hundred years. Lime abundant, only three miles distant. Plenty of pine and other timber on the hills and in the valleys, in the midst of a fertile healthy region. Sugar maples are on the banks of the streams, and the chinquapin, which in Virginia is only a large shrub, is here a tree twenty to thirty feet high, and two feet in diameter.

NACOGDOCHES COUNTY.

The iron works of Mr. R. W. McLain, in the northern part of this county, are situated similar to the preceding, amid hills, among pines, and with plenty of good water. No lime was here used; the blowing process, consisting of roasting and breaking up the ore, was here adopted. The metallic iron made here is said to have been better than most of the imported iron. 150,000 pounds of hammered iron bars were here made in about eight months, when the work was stopped. At the close of the war, Mr. McLain told us that in sinking wells, at and near the iron hills, an iron ore of good quality was passed through, until water was obtained at the depth of twenty to twenty-eight feet. The ore thus found was in loose detached masses. Mr. McLain, having a large body of land, told us that he would give three hundred acres of land at the side of the works to any one who would there manufacture iron. The works had been burned; hence all would have to be begun anew. These works were in the midst of a fertile country, about six miles from Linn Flats, and twelve from Nacogdoches. Near Linn Flats are beds of a very good brown coal, equal in quality to any we saw in Eastern Texas. See notice of this elsewhere.

BOWIE, CASS AND MARION COUNTIES.

Iron ores extend over a large portion of these counties, in the northeastern part of the State, where they have been largely smelted. A Mr. Nash had works for smelting ore in Cass county, which were in successful operation several years before, and also during the war, at the close of which they were seized by the United States Government, and the work of smelting suspended, since which it has not been resumed. Specimens of the iron and steel made here and the ore used are in the State cabinet. In the same county a Mr. Hewes is said to have had a smelting furnace during the war, now suspended.

The furnace at Kelley's iron works, about five miles northward from Jefferson, we found in full blast, producing daily upwards of one thousand pounds of pig iron. The ore occurs here in places, in and over the hills, like that at Philleo's, Young's, etc., but not as abundant, yet sufficiently so for all practical purposes. To save hauling, the ore was being excavated from the hill at the furnace. The furnace top is near the top of the hill and its base at the foot of the hill. Hence the ore is dug out, wheeled a short distance, thrown into the top of the furnace, and the melted iron runs out at the base. The following proportions of material are here used for smelting the ore:

18 bushels charcoal.
750 pounds ore.
60 pounds lime.

No available lime being near, oyster shells from New Orleans and elsewhere were used.

SECTION ON HILL AT KELLEY'S FURNACE.

1.	Surface soil, sand and gravel, mixed with iron ore	3	feet
2.	Clay with small seams of ore	16	"
3.	Ore (limonite)	4	"
4.	Is No. 2 repeated	18	"
5.	Brownish gray ore in nodules (limonite)	4-6	"

The hills around are clad with pines, mixed with other trees. The pine region extends northward to the State line.

Seventy workmen are employed at the furnace and fifty at the foundry.

I omitted to state that three hundred men were employed during the war at Philleo's Iron Works, near Rusk. Many of these men have families, hence the importance of encouraging manufactures of every available description, for they give a permanent population—a people who buy from the farmer and merchant; at the same time they add to the real available wealth of the State.

Iron ores are prevalent in nearly every county in the State where the older tertiary rocks prevail. In Anderson county, about three miles southward of Palestine, on land belonging to Judge Reagan, an excellent quality of iron ore crops out on all sides of a large hill, forming an extensive bed, so reported to us by the Judge. On the road from Jacksonville to Rusk, in Cherokee county, we passed over several iron hills. Cherokee, to all appearance, has iron ore enough to supply all the wants in iron of the entire South for centuries. It should have been stated before that iron was made from the ores of Anderson county during the war. We did not have time to visit the locality. Iron ore is also in the vicinity of Whitesboro, in Grayson county, in the tertiary of that region. These ores are in an iron hill or ridge, a few miles west of the town.

In the hills, near Mt. Enterprise, in Rusk county, there are good iron ores, similar to the best in Cherokee county, and sufficiently abundant for the manufacture of iron.

These tertiary ores are sedimentary deposits in beds and in concretions in the clays and sands. Red clays derive their color from the iron, which also adds to their fertility. The average yield of these ores, where they have been smelted, is reported to be about 50 per cent. Some manufacturers report much more, but we prefer to give safe and reliable estimates, that future manufacturers may not be disappointed. Chemical analysis of this or that ore is of little practical use, unless several specimens are carefully selected, so as to give a fair average of the ore to be analyzed. Generally only the best are sent the "chemist," hence the manufactured yield of metal seldom equals that reported by the chemist. This deficiency also arises from the greater or less wastage incidental to all manufacturing establishments, where things are not and cannot be managed in such an accurate, saving manner as is done by a good chemist in the laboratory.

IRON ORES OF WESTERN TEXAS.

These ores are mostly of a different class from those of the tertiary period. They are magnetites or magnetic iron ores, which are more massive, and yield a larger per cent of metallic iron than the tertiary ores, but they are also more difficult to smelt.

In Burnet, beds of magnetite are within two or three miles of the town of Burnet, from whence they extend southwestward into Llano county, in the vicinity of Packsaddle Mountain. Large boulders of the ore lie scattered over the surface, and it also occurs in immense beds. The rocks of this region are granites, and their associated rocks of igneous origin. Here there is plenty of lime, also of cedar and other timber, the best of water in abundance, a delightful, healthy climate and fertile soil.

The largest deposit of iron ore yet known in Llano county is on a creek near a Mr. Epperson's, about twelve miles west of the town of Llano, and from six to eight miles southeast of the Smoothing Iron Mountain. It is an immense and apparently solid mass of iron of an oblong, oval form, surrounded by granite, having evidently been raised up from below with the latter. It has a length of about 800 feet, a width of about 500 feet, with an elevation of from 25 to 30 feet above its visible base. Loose masses of ore, some of which are of several tons weight, lie scattered over the surface of the iron hill and on its outskirts. There is no ore known in any country which gives a larger per cent of metallic iron than this, nor any which will make a better quality of iron.

A large bed of iron ore of a similar character to the preceding is distant from it about eight miles, in a northwesterly direction. It lies between two granite ridges, and is traversed by veins of quartz in all directions. Here, too, there is ore enough for all practicable purposes to make metallic iron for ages.

On the road from Honey Creek to the town of Llano, about eight miles from the latter, the magnetite ores are in beds, extending across the road and into the adjacent mountain.

Northward, in the carboniferous region, in the southern part of Stephens county, iron ores are reported as rich and abundant.

Lime and timber, to make charcoal, for the manufacture of iron, abound in Llano county; nor are beds of good stone coal far distant, at the north, those of Coleman county being less than one hundred miles.

We know of no State which has greater advantages for the manufacture of iron than Texas, both in its eastern and western portions, taking climate, quality of ore and its availability, it being at or near the surface, fuel, both charcoal and stone coal. Only think what a saving to the State it would be to manufacture our railroad iron. Much more is paid out in this direction than would pay for the manufacture of the iron at home. Taking everything into consideration—people, as permanent citizens, added to our population, capital added to its available wealth, increase of trade, given to the farmer and merchant—all these things, and more, prove unmistakably that it would be better and more economical for the State, if the iron, needed by railroads and by the people, were made in Texas.

The patent puddling apparatus, which is expected to revolutionize iron manufacture, being an immense saving in cost, has recently been introduced into the Rockdale Iron Works, which are 70 miles north of Chattanooga, at Rockdale, Tenn. Iron is now being made at less expense than in any other part of America.

It is said that rails for railroads can be made at Rockdale and sent to Pittsburg at less cost than they can be made at Pittsburg. The ore at Rockdale is said to cost $2 per ton at the furnace, coal only about the same, and limestone 80 cents.

The iron ores of Pennsylvania yield from 30 to 60 per cent. of metallic iron; the most of those manufactured give less than 50 per cent. The cost of the ores at the furnaces is reported to be from $3.50 to $4.50 per ton. Yet iron is made at large profits in Pennsylvania, which State, about twenty-five years ago, was loaded with debt and her people taxed heavily; but now her railroads, her iron and coal give an income sufficient to defray the expenses of the State government, and the taxes of the people are little or nothing.

Texas has more and better iron ores than Pennsylvania. She has plenty of coal, a better climate, a soil equal to any in the world; these and other advantages, rightly managed, will make Texas one of the most prosperous and wealthy countries of the world.

COAL OF THE TERTIARY.—BASTROP COUNTY.

On Cedar creek, three or four miles from the town of Bastrop, on the west side of the Colorado river, are some large beds of brown coal; on land belonging to Mr. P. H. Jones, in the north-west corner of the Rosseau survey, is the following section, taken by the writer in 1860:

DESCENDING.

1. Yellowish sandy loam........................10 feet.
2. White and yellow sand rock, varying in hardness.. 7 "
3. Brown coal bed..............................8-10 "
   to the bottom of the stream, and base of the coal not seen.

About one-quarter of a mile below this, on the same creek, the following section appears:

1.	Surface soil, light sandy loam	3 feet.
2.	Sand and gravel, with large pebbles	6 "
3.	Light gray sand, containing a few septaria, the septa filled with iron	8 "
4.	Blue and black shale, with sulphuret of iron and fragments of coal	10 "
5.	Coal to the bottom, and base not seen	4 "

I traced the length of this bed, to the distance of 150 feet, coal of fair quality.

From one and a half to two miles further down, on the same creek, in the Lightfoot survey, there is another large coal bed 80 feet long, where is the succeeding section:

1.	Surface soil, grayish white sandy loam	6 feet.
2.	Yellow, soft sandstone, streaked with white seams	2 "
3.	Coarse brown sand	5 "
4.	Coal, containing thin seams of dark blue and pyritones shale	9 "
5.	Blue clay, with large masses of hard iron stone, and septaria, to the bed of the stream	6 "

A few rods below this, the coal appears again in the bed of the stream, from which it extends down the creek about three miles. Last spring I sent Mr. Charles E. Hall to examine the coal beds of Bastrop county.

Last Spring Mr. C. E. Hall and Mr. Horne, of the survey, visited the coal deposits of Bastrop county. At Mr. Goodman's, they learned that coal from his mine has been used to run the engine of a cotton factory, in the town of Bastrop, for more than six months, to the perfect satisfaction of the proprietors of the manufactory.

COAL OF ROBERTSON AND MILAM COUNTIES.

From Little river, in Milam county, north-eastwardly to the Herndon place on the Brazos, there are almost continuous coal beds, as is indicated by wells along the route; distance, 10 to 12 miles. On Little river are two beds, the upper 4 to 5 feet thick, and the lower 6 to 8, to the bed of the stream—the base of the coal unknown.

It has an exposed thickness in the banks of the Brazos river, a few rods below the old dwelling of Mr. Herndon, of from 15 to 25 feet, the base of the coal bed not seen, the coal forming the bed of the river, and extending across the stream. Here it has little or no rock roof, but, instead, is covered with from 4 to 6 feet of clay and dark vegetable soil, as seen on the banks of the river. This, however, will detract little from the value of the coal, if in mining the method is adopted which is practiced in some of the English mines, only prop for a few feet, take out all the coal, let the roof fall in, and the working go ahead into the bank. This could be easily done at the Herndon place, which has about 700 acres, all or nearly all of which is valley land, underlaid by the coal, which again outcrops in the banks and bed of the Little Brazos, 2 to 4 miles westward.

On re-visiting this place last spring, I was sorry to find the coal bed on fire, and to learn that it had been on fire about two years. It burns slowly, for the surface soil falls in and smoulders the burning mass below. Floods in the river have, on several occasions, nearly extinguished the fire, at which times it might have been put out with very little labor.

Concretions of sand and limestone abound in the strata of the hills which overlie the coal. Many of these are of large size, some of them being from five to ten feet in diameter. These concretions are loose in large quantities in the bed of the Brazos, at the upper end of the coal bed at Herndon's, where also some of the loose lime rocks are filled with cretaceous fossils, cryphias, ostnas, etc., showing that the cretaceous strata are not distant. In the sandstones here, we found impressions of leaves and palms, some two and three feet long; also, many leaves of trees or shrubs of exogynous plants, nearly all of which are entire, only one specimen of a lobed leaf being found—this is a platanus. Some of these entire leaves are very large, and have prominent veins. They evidently belong to the eocene of the tertiary, and are in strata overlying the coal. In none of the tertiary coals of the State have we seen vegetable remains in good preservation, in the shales in contact wilh the coal, excepting in Fayette county, where are oblong ribbed fruits, about an inch in length.

This Brazos coal bed probably extends eastward five or more miles, a well having been sunk not far from the town of Calvert in which a coal bed was penetrated twenty feet, and the boring stopped on account of the flow of water. It may be, and probably is, the case that this water is merely a small stream flowing over the coal bed, similar to those passing over the coal into the Brazos, where are some small streams and springs, which, however, affect only a small porcion of the coal bed; hence, at a different place near Calvert, water might not be found in the coal.

Northeastward from the Brazos coal, about eight miles east of the town of Bremond, at Mr. David Barclay's, we obtained the following section of his well:

1.	Surface, clay and sand	1 to 2 feet
2.	Hard, light gray, compact sand; so hard that it does not cave and needs no curbing	35 feet.
3.	Coal	4½ "
4.	Sand rock, rather soft	16 "
5.	Fire clay	4 "
6.	Coal	13½ "
7.	White frieble sand rock	17 "

Water not abundant. Mr. B. intends to dig deeper. Mr. B. says that No. 7 contained many small fragments of coal.

At Mr. Morgan's place, half a mile from Mr. Barclay's, in ravine, is the section below:

1.	Light gray sandy clay	6 feet.
2.	Fire clay	8 in.
3.	Coal bed	2 feet.
4.	Fire clay	2 "
5.	Coal	1-2 "

only being exposed and depth unknown.

Near Mr. Smith's, about one mile from Mr. Barclay's, the coal is exposed along a ravine for several hundred feet, at the depth of six to ten feet from the surface. A well was dug several years ago, near Mr. Smith's house, to the depth of nearly twenty feet, where coal was dug into to the depth of about ten feet, without finding the bottom of the bed, and the well abandoned.

As coal has been found in all wells in the vicinity of Mr. Barclay's, it is probable this coal bed extends over an area of several hundred acres. This coal is of fair quality, very similar to the Brazos coal. Northeastwardly from Bremond, about eighteen miles, on Head's prairie, in Limestone county, near the Irving place, the coal crops out in several places in a ravine. Here the coal is of a compact texture and good quality, having been tested by blacksmiths, and also for propelling an engine to run a cotton gin at Kosse. Here the coal is so pure that it does not injure the water in wells and springs, all of which afford excellent water. This bed of coal is about four miles long and three wide, and six or more feet thick. At one place in the ravine, we were told that it had been dug into to that depth without finding its base. A few miles distant coal was found at the depth of eighty feet.

Some gentlemen of Dallas have given me the following analysis of this coal by Prof. Maurie, of Chicago:

Moisture	12.00
Combustible matter	42.00
Fixed carbon	32.00
Ash	13.00
Coke	54 per cent.

Prof. Maurie wrote, in reply to the Dallas gentlemen, that the coal was excellent for fuel, and also for the manufacture of gas. The yield of coke also shows that it is good for the manufacture of iron.

LEON COUNTY COAL.

At Bear Grass, in the northern part of Leon county, there is an exposure of coal in a ravine, at a mill run by water from springs. Here the coal extends across the stream, and is seen again 200 to 300 feet above, in its banks, these being nearly covered by sand. A few rods distant, about twenty feet above the ravine, a well was dug by Messrs. Roberts and Moore, of Bremond. At about twenty feet from the surface, coal was found, and passed into to the depth of nine feet. Several hundred pounds of this coal was taken by them to the State Fair of 1873, at Houston, where a cotton gin, on exhibition, was being run by an engine heated by Pittsburg coal. A trial was here made to see which was the best, and the Texas coal found fully equal to the Pittsburg; so said the man (Col. Winship, of Atlanta) who had charge of the engine.

We traced this coal for several hundred yards up the ravine, and also saw the fire clay, which is usually above the coal, exposed in other ravines in the vicinity. Hence, there is no doubt but that the supply of coal is ample for all practical purposes. Saw some very good iron ore on the hills here, but apparently not enough for the profitable making of iron. As our stay here was only a part of a day, it may be that other and more extensive beds of iron ore may be found in that neighborhood. Here are fine and permanent springs. The situation is pleasant, amid hills; the International railroad only eight or ten miles distant. These things make this a good place for a manufacturing town.

Small deposits of coal are exposed in ravines about seven miles southwest of Centerville, near a Mr. Patrick's. It is possible that thicker beds of coal than now shown there may be found at a greater depth.

A large coal bed is said to be seen in the bank of the Trinity river, about fourteen miles below the Alabama Ferry.

COAL IN ANDERSON COUNTY.

Near Douglas, in this county, boring was being made for coal (June, 1874), at a place we visited, accompanied by Dr. Hunter, of Palestine. Here there is a small bed of coal at the bottom of a ravine. A shaft was being sunk on the hill above. This boring, at that place, was unwise, because the ravines around had already penetrated the earth to a considerable distance. Did not think the indications for coal of much promise, and have not heard the result.

In the northern part of this county coal beds of small extent are exposed in ravines on the Bergen league, a few miles north of Fosterville.

COAL OF RUSK COUNTY.

About four miles northeast of Henderson, on the banks and in the bottom of a small stream, is the outcrop of a large bed of coal. On the sides of the bank, about three feet of the coal is seen. Mr. Park, who accompanied us to the spot, said that he had dug into the bed of coal to the depth of four or five feet, without finding its bottom. This coal is compact, and resembles in appearance the best coals of Robertson county. Another bed of coal, about six miles southward of Henderson, is reported to have been passed through in digging a well. This bed is said to have been about six feet thick.

OTHER TERTIARY COALS.

About thirty miles south of Marshall, on the Sabine river, at the Coal Ferry, on the Trammel Trail, is a bed of coal which, at low water, can be seen to extend across the stream. Coal is also reported to have been lately found in a bed 3 to 4 feet thick, a few miles from Marshall.

At the Sulphur Creek Bluffs, in Cass county, there is a coal bed 3 to 5 feet thick. The following analysis of this coal was made many years ago by Dr. Riddell, who was then Professor of Chemistry in the University of Louisiana, at New Orleans. He was a brother of the late chemist of the Texas survey. This analysis was made for a gentleman of Jefferson (Mr. Moseley), to whom we are indebted for it:

Pyroligneous oils, hydro-carbon and other valuable products for fuel	47.80
Coke	37.10
Tar	4.10
Ashes	11.00

Specific gravity 1,384.

Dr. Riddell reported the coal to be good, and the above analysis proves it to be good for fuel for the manufacture of iron, after having been coked; also superior for making gas.

Not far from the Jourdan Salines coal was found at the depth of about 70 feet, in a well sunk by the Texas Pacific Railroad Company. Bed 3 to 4 feet thick and coal good, so reported.

At Dallas specimens of brown coal were given us, which is said to occur about 25 miles northwest of the city. This is probably a tertiary coal in the upper Cross Timbers.

Coal

In the northwest part of Grayson county, not far from Whitesboro, are some beds of coal 2 to 3 feet thick in the tertiary. Surface specimens of an inferior quality, and none others seen.

We have received specimens of coal from Burleson county, and also from several counties southwestward nearly to the Rio Grande, hence these tertiary coal beds may be said to begin near the Rio Grande, southwest of San Antonio, and extend in a northeast direction to Bowie county, near the northeast boundary of the State. The larger beds are along the western boundary of the eocene of the tertiary, near its junction with the cretaceous. Below, or in the coal beds, we have found no tertiary fossils, with the exception of the fruit in the shale above the coal in Fayette county, near the southern boundary of the eocene. A few miles above the Brazos coal at Herndon's—it may be 25 or 30 miles—in the west bank of the Brazos, is a shale 25 to 30 feet thick. This shale is very friable, and probably of the same age as the coal. It contains tertiary fossils.

It was customary a few years ago to call all tertiary coals lignites, or imperfect coals, and of little value. But the experience of the last fifteen years has proved that coal of good quality often occurs in the tertiary. It is so in Texas, and extensively so in the Rocky Mountain States and territories. Says J. Ross Browne in a report on the mineral resources of the Western States and territories, p. 228:

"Modern geologists have abandoned the idea that coal, to be of a good quality, must be found in one particular formation. Experience, the most reliable guide, contradicts such a theory. Researches in India, China, Australia, New Zealand, Chili and the States on the Pacific coast of the United States, prove that good coal, adapted to nearly all purposes, is found outside of the carboniferous formation. Science has failed to demonstrate that good coal may not be found in any geological formation."

Coals of the tertiary period are now extensively used in the Rocky Mountain States and territories, and also in those of the Pacific coast. In California, coal is now mined to the depth of even 800 feet at the Black Diamond mine. It is found by experience that the tertiary coal of the Pacific States "is less destructive to boilers and grates, than the anthracite imported from Pennsylvania, or the bituminous coals of Australia."

Dr. F. V. Hayden, United States Geologist, in a report to the Commissioner of the General Land Office, from Silliman's Journal, of March 1868, says: "My examination of the geology of Nebraska, during the past season, failed to develop any workable beds of coal within the limits of that State. My attention was then directed to the great lignite deposits of the Laramie plains. I found the lignite of excellent quality, in beds from 5 to 11 feet thick, and I estimated the area occupied by this basin at 5000 square miles. Its most eastern limit is about 10 miles east of Rock Creek." Here follows a list of localities.

"The lignite taken from the beds on Rock Creek is from the outcroppings, yet it burns with a bright, red flame, giving out a good degree of heat, leaving scarcely any ash, and is quite as desirable fuel for domestic purposes, as any wood. It is non-bituminous, exhibits just a trace of sulphurate of iron, which, decomposing, gives a rusty, reddish appearance to the outcrops, and there are seams of jet, 1 to 12 inches in thickness, which look much like cannel coal, and is thus termed by the miners.

The Union Pacific Railroad will pass directly through those great coal fields, and as most of their freight will go westward for many years, the cars, on their return, can be loaded with this lignite, thus to be distributed through Nebraska, at a cost much less than that of wood at the present time.

There are also indications of an abundance of iron ore in the vicinity of these deposits, and the Union Pacific Railroad Company contemplates establishing rolling mills in the Laramie plains at no distant period.

The next point visited was South Boulder Creek, the Marshall mines, which are probably the most valuable in the West. I made a pretty careful examination of these mines, which have been wrought for four or five years. An average of 50 tons is taken from this place daily, and sold in Denver at prices varying from $12 to $15 per ton. The beds are at the foot of the mountains, and dip to such an extent as to expose the whole series, eleven in number, varying from 5 to 12 feet in thickness, so that we have from 30 to 50 feet at least of solid lignite."

I give the above long extracts, because the value of Texas tertiary coal has been questioned, lignites, as they have generally been called.

Prof. Rogers, many years ago, in his report on the geology of Pennsylvania, proposed to class coals according to their chemical composition. He proposed the following classification, which seems preferable to any other, and better fitted to designate coals as they are now known.

1st. Anthracites. { Hard Anthracites.
Semi, or Gaseous Anthracites.

2d. Common Bituminous Coals. { Semi-Bituminous.
Bituminous.

The semi-bituminous he divides into semi-bituminous cherry coal, and semi-bituminous splint coal.

The bituminous into coking coal, cherry coal and splint coal.

3d. Hydrogenous, or Gas Coal. { Cannel Coals.
Hydrogenous shaly coal
Asphaltic coal.

When Prof. Rogers proposed the above classification, the tertiary coals of Texas and the great West were little known, so little, that they were not alluded to by him. But, with perhaps slight modifications, it will include these tertiary coals, which may be placed in the second and third classes.

In Texas, no anthracites of any commercial value are known; but among the tertiary coals of the State are the semi-bituminous and the hydrogenous, or gas coals. Most of them belong to the semi-bituminous, that is, they abound in the ingredients which make bitumen, as shown by chemical analysis, and by the scent which they give when burned.

That they are valuable as fuels, and for most all the purposes to which coal is applied, has already been proved by experiments made on a large scale. The coal of Bastrop has been satisfactorily used for more than six months to run an engine in a cotton manufactory at Bastrop. That of Robertson county has been tested on an engine to run a steamer, also, tested in New York and at Pittsburg and pronounced to be a good and valuable coal for the ordinary purposes of fuel, and also, for the manufacture of iron; the person having charge of the experiment at Pittsburg, wrote to a leading citizen of Austin, Judge Terrill, that this coal would run puddle iron without coking.

In Washington Territory, coals of the middle tertiary (miocene) are used to run engines on steamboats and elsewhere. Let it be remembered that our Texas coals under consideration, are of the eocene, or older tertiary, and that too, at the very dawn of this period.

According to Prof. Rogers, the semi-bituminous coals also soften and swell into compact coke, but do not agglutinate at all, or only slightly; they are, therefore, equally eligible with the non-coking bituminous varieties for certain purposes of combustion, while they are preferable to them in heating power, in proportion to the greater weight of solid matter they contain.

I have been told that some of our tertiary coals, when tested on the engines of railroads, burn too fast, and are not easily regulated, as the grates of the engines are now made. It is probable that, with differently made grates, where the draft can be accurately regulated, this difficulty would be removed.

Our former State Geologists, Drs. Moore and Shumard, regarded the tertiary coals of the State as of little value, and thus pronounced them, without taking the trouble to test them in a practical manner; hence, it is difficult to convince many people of their real value as fuels, and hence the tests which were made a few years ago with the Brazos coal of Robertson county by an Austin company, who, finding it a good coal, invested in coal lands there; since which, some members of the same company have also bought coal lands in Bastrop county.

Let the people of the State be assured that many of the coals of Central and Eastern Texas are of equal value to many coals of the carboniferous period, and even superior to some of them, excelling in this respect as fuel for public and private buildings and other purposes, to which they will ere long be applied.

I will add another item which I had almost forgotten. A few years ago, Willard Richardson, of the Galveston News, received a letter from the secretary of a northern coal company, requesting information about the coal and iron of Texas. This letter was referred to me, and a long correspondence ensued. I sent him specimens of the coal and iron of Robertson and Milam counties, both of which were reported by him to be better than he had expected to see from Texas. This company would have started the manufacture of iron in Robertson county, had not radical rule and radical reports of disorder in Texas prevented. Since I began to write this report, I have received a letter from the secretary of another northern company, inquiring about the coal and iron of the tertiary period, of the State. To this letter I have not yet had time to reply.

Our State has been in such an unsettled and unfortunate condition, politically, as to prevent many capitalists from investing here, but under the present government confidence is again restored, and we have the dawn of a good time coming, when our coal will be used, and our iron ores manufactured.

COAL OF THE CARBONIFEROUS PERIOD.

The carboniferous extends over a much larger area in the State than we supposed possible last spring, at the commencement of our labors in the field, and if the survey had accomplished nothing more than has been done in this portion of the field, it would have done a good work. The carboniferous formation has been traced from the western part of Montague county westward through Clay and Jack, into Archer and Young counties; thence westward through

Throckmorton into Haskell county, and south through Jones, Shackelford and Stephens into Callahan, Coleman and Brown counties. From reports from Eastland county, and coal said to be found there, there is no doubt but that it is also included in the boundaries of the carboniferous, which extends southward from Brown and Lampasas into Llano and Burnet counties. From former explorations, I feel confident that Concho, McCulloch, Menard and Mason counties belong mostly to the carboniferous period. It is also highly probable that a large portion of the unexplored region of the western part of the State belongs to the same formation. This much we know, that we have a larger coal field, by many thousand square miles, than has ever before been made known.

The coal field in Young county, around Fort Belknap, has long been known, and its coal was used by the government officers, when Fort Belknap was occupied by them, many years ago.

A part of this bed of coal is about a mile above the Fort, outcropping in several ravines which empty into the Brazos river. On a recent visit to this place, with Col. Graham, of Young county, we found two beds of coal there, the upper between two and three feet thick, and the lower exposed about three feet in the bottom of the ravines, and base not seen. This coal has been quarried to a considerable extent lately for the use of blacksmiths. At present, there are but two families living at the Fort, the government buildings having mostly been destroyed, and the remainder being in ruins. As there is plenty of good wood there, the coal is not now used for domestic purposes.

On Whiskey creek, about two miles north of Fort Belknap, there is a fine exposure of the coal strata, of which the following is a section, taken from near its junction with the Brazos river:

1.	Soil, sandy loam	1	foot.
2.	Sandstone (conglomerate)	44	feet.
3.	Coal	1½	"
4.	Sandstone and shale, alternating	8	"
5.	Coal	3½	"
6.	Sandstone	26	"
7.	Shale and limestone, fossiliferous	2	"
8.	Coal	1½	"
9.	Light gray, friable shale to bed of stream	3	"
		90½	feet.

A few hundred yards higher up the stream, where coal, a few years ago, was mined to some extent, is the following section :

1.	Shale, covered with sandstone, extending far back and not measured	—	feet.
2.	Black, yellow and ash-colored shales	10	"
3.	Fine grained sandstones	½	"
4.	Blue fire-clay	1½	"
5.	Coal	4	"
6.	Clay, containing selenite	½	"
7.	Slope to the creek	—	"

Here the sandstone above the coal contains coal plants, and is ripple marked. There are several other places on Whiskey creek where the coal outcrops.

North of Fort Belknap, at the distance of about six miles, near the former residence of Judge Harmenson, is a bed of coal five feet thick. This bed is exposed along the base of a hill to a distance of from twenty to twenty-five yards. Here coal has been dug out, both for fuel and for blacksmithing.

In the northern part, on Coal creek, near the Salt Fork of the Brazos, in Young county, is a large bed of coal, which has lately been mined to some extent for the use of blacksmiths. Here the coal is of a very good quality, in a bed five to six feet thick at the base of a small hill. Owing to recent rains, and the half-way, careless manner of mining the coal, its real thickness could not be measured, but it probably is thicker than stated above. Above the coal strata is a bed of limestone one to two feet thick, and above this, sandstone five to six feet, and again, limestone two to three feet, capped with a brown sand rock. The upper limestones in the vicinity abound in fusilina shells. The tops of the adjacent hills have the conglomerate, which overlies a large portion of the hills of the coal region.

Coal is said to outcrop on the banks of a small stream, about three miles from the coal on Coal creek.

SECTION OF THE HILL OPPOSITE THE FALLS OF THE SALT FORK OF THE BRAZOS, AT GRAHAM.

1.	Conglomerate	12 to 16	feet.
2.	Clay and sand, yellowish and blue	30 to 35	"
3.	Fossiliferous, hard, blue limerock, which gives a ringing sound when struck with a hammer	1 to 2	"

4.	Yellowish brown sandstone..............	2 to 3	feet.
5.	Blue clay and shale, containing in its upper portion calamites, and other coal plants.	55	“
6.	Sandrock, forming the falls..............	3 to 4	“
7.	Conglomerate, (and base not seen)........	3	“

No. 5 extends along the side of the mountain more than half a mile, in some places having an abundance of ferns and calamites. Both above and below No. 3, adjoining it, fossil shells are abundant and finely preserved. Productus Rogersii, Athyris subtilita, Fusilina—two species and both very common, Belerophons, Crinoids, Allorisma subcuneata, and several other bivalves; Pleurotomaria tabulata and sphærulata, Spirifer cameratus, rare. Of these, and many other carboniferous fossils, we obtained a large collection.

The bed of the Clear Fork of the Brazos, in the northern part of Stephens county, is composed of coal, which extends under both banks, as is seen in low water, at which time the coal is quarried for the use of blacksmiths. It is obtained in large blocks, is black, breaks with a concoidal fracture, and is in every respect a very good coal. We saw specimens of it at a blacksmith's, at Fort Griffin. This blacksmith told us that coal had been quarried from that coal bed during the last ten years, and that the bottom of the the bed had not been reached. At the time of our visit rains had raised the streams so high that we did not go to see this coal bed.

On Hubbard's creek, in the same county, there is another large bed of coal, four to five feet thick, which also has been used quite extensively by blacksmiths, showing that these coals are quite free from sulphur and other impurities.

COAL IN CLAY COUNTY.

At the well of Mr. John Preston, two and a half miles southeast of New Henrietta, we obtained the following:

SECTION. SURFACE.

1.	Sandy clay soil........................	18	inches.
2.	Reddish brown clay....................	23	feet.
3.	Yellowish brown shale.................	10	“
4.	Blue shale............................	6	“
5.	Red copper clay, very hard............	6	“

6.	Yellow sand rock	18 inches
7.	Blue shale	12 "
8.	Blue sand, very hard	6 feet.

And well unfinished and being dug at the time of our visit.

No. 3 abounds in fern leaves and calamites in a fine state of preservation (carboniferous).

No. 4 has small particles of coal.

No. 5 contains marks of roots and stumps, six or more inches in diameter. A large portion of the ferns are of the same species as those found in Young county.

We were told at Henrietta that two men had recently found a bed of coal several feet thick about five miles distant from the town, but they would not tell where, because they wished to buy the land. Other localities of coal in Clay county were also reported.

COAL IN MONTAGUE COUNTY.

In the southwest corner of this county, on Sandy creek, about four miles from Judge Marlett's, a coal bed extends along the creek about three hundred feet. At this place we obtained fine specimens of calamites and ferns. The outcroppings of the coal here are of an inferior quality, but good coal may abound farther into the side of the hill, at the base of which lies the coal bed.

About a mile up the creek, and high up in the hillside, is another coal bed of similar character.

COAL OF COLEMAN COUNTY.

On Horne creek, nearly eighteen miles southwest of Camp Colorado, is a coal bed, which is worked by a Mr. Waldrup, who sells coal to the blacksmiths.

Near the Colorado river, about midway of the southern boundary of the county, is a coal bed about four feet thick, which is said to outcrop near the base of a hill, and also on the opposite side of the same hill. At a blacksmith shop in Brownwood, Brown county, I saw specimens of this coal.

There is also said to be a coal bed immediately south of Santa Anna Mountain, and another bed at Blackwell's ranche, on the line between Coleman and Brown counties.

On Little Bull creek, in Coleman county, is a bed of coal, which is said to be six to eight feet thick, from whence coal is furnished to the blacksmiths of San Saba county, where we saw it used. The use to which it is applied proves it to be excellent.

COAL IN LLANO AND SAN SABA COUNTIES.

In the Honey creek cove, four to six miles from the Packsaddle Mountain, coal in large pieces has been found in the bed of the creek. At this locality, I saw shale at the base of the bank of the creek, but did not see any coal in its native bed. Specimens of coal from this locality are in the bed of the stream, and if the coal can be obtained in large quantities (which is quite doubtful) it will prove to be a valuable acquisition for use in manufacturing the iron ores of that region.

In San Saba county, north of the San Saba river, are shales in hillsides, the hills being mostly sand rocks of the carboniferous age. In such places, Dr. Watson and Mr. Barrett told me they had seen coal. These gentlemen are noted for hunting the minerals of that region. They also report coal in Mason and McCulloch counties. They gave me some very fine mineralogical specimens for the State cabinet.

The preceding are mostly mere outcroppings of the coal of the carboniferous formation, and they are amply sufficient to convince us that in this large coal field there is plenty of good coal. Let us remember that most of these are only surface outcroppings; that in all the coal regions of Europe, and the older States of this country, the best coal is generally obtained at a great depth, coal being mined in England to the depth of more than fifteen hundred feet, and in this country to more than eight hundred feet. Throughout our entire coal region, both tertiary and carboniferous, it is highly probable that at greater depths more coal will be found.

A few years ago, the State of Illinois was supposed to be almost without coal, only a few outcroppings being known in distant parts of the State. But the geological survey of that State has stimulated deep researches to be made at the proper places, and the result is a great abundance of good coal.

Our carboniferous region is now but thinly settled; but now people are flocking there and making homes for themselves and families, and these people are every year finding new coal beds. The survey has taught many where and how to look for coal. In one instance, we found coal in the cretaceous. This coal is but a small seam in the banks of the South Gabriel, near Liberty Hill, in Williamson county. Limestones with cretaceous fossils are above and below the coal, which is only about two inches thick, of small extent, and overlaid by a thin strata of sandstone.

POTTER'S CLAYS.

These abound throughout the carboniferous and tertiary of the State. There are few, if any, counties in these regions in which good common wares cannot be made.

PORCELAIN WARE

Can be made of good quality, and probably of the very best, from the feldspars of Llano county, of which there are veins two and three feet thick near the base of Packsaddle Mountain.

COPPER.

Texas has one of the richest copper regions of the world, covering a large portion of the carboniferous formation, in the northern part of the State, especially abounding in the upper carboniferous. Associated with the copper, I found in several places, the present season, strata unmistakably carboniferous, as indicated by their fossils. Examples of this occur in Clay, Young, Throckmorton, and Haskell counties. In Throckmorton county, on the Graham road to Fort Griffin, about two miles before its junction with the Fort Belknap road, near the base of a hill, is a strata of copper ore about one foot thick. In the rocks above and below this are carboniferous shells, many of which belong to the same species as those before named, as being found in the hills near Graham, in Young county. During a hasty trip into Young, Archer and Clay counties, in 1861, from the appearance of the hills and rocks of Archer county, and their resemblance to descriptions of the permian, of Germany, I was led to believe that Archer and other portions of the copper regions also belonged to the permian, and I thus stated in the Texas Almanac of 1868. Now, I think they belong to the upper carboniferous, because thus far no permian fossils have been found in that region, but upper carboniferous have been found in many places during the present season, associated with the copper bearing rocks and clays.

The copper lands extend from the western part of Montague county westward into Haskell county, and probably much farther westward and southwestward. In the southwestward part of Montague county, near the residence of Mr. Pevler, at his spring, is a bed of copper ore, about four inches thick, extending into the bank between sandstone. It is a green copper, (crysocolla and malachite), associated with cuprite or red copper ore. Mr. Pevler also showed us this same form of ore in a bank about one mile south of his house, and again, in small seams, in sand rocks, about half a mile northward from his house. Mr. Pevler, who has an interest in the copper mines of Archer county, and who has worked there in getting ore six months, now owns the copper lands near his residence. The hills and rocks of the Montague copper, are very similar to those of Archer county, and indeed of the whole copper region, where a red clay often and generally prevails. This clay is impregnated with the red oxide of copper, to which it probably owes its color. In it, copper concretions occur, which are frequently washed out, and lie at the base of the hills. Clays often form a large portion of either the base or middle of the hills. Rains and other causes wash the clays from beneath the rocky strata above, and give the hills a jagged and ruined appearance, often covering their sides with broken rocks. Sometimes large masses of rocks stand out alone on clay supports.

In the northwest part of Clay county, are some of these copper hills, at the base of which we found green, blue and black copper ores. These are near the mouth of the Big Wichita, and not far from the Red River. The black copper ores are generally overlooked by copper hunters, who are wide awake in their search for the green and blue ores.

In Wichita county, on Gilbert's creek, about three miles from its junction with the Red River, there is a deposit of green, blue and red copper, in a clay bank at the edge of the water. A few years ago, a considerable quantity of ore, from this place, was sent to Philadelphia, where it was smelted and said to yield more than sixty per cent. of copper. A company was formed for the purpose of working the mine, but the war came, Mr. Gilbert died, and nothing more was done with the copper mine, which now belongs to the children of Mr. Gilbert, some of whom are minors. In several other places, on the banks of this creek, I found copper ores. At the place formerly worked, there is said to be a large bed of copper, at the base of the hill. The clays from above had fallen in, and I could only see loose masses of copper, only the outcroppings, which had not been considered rich enough to take away. Here the bed of copper is not far below the surface, which is a large prairie, the whole country being nearly all prairie land.

Knox county is said to have some very rich copper beds. The postmaster at New Henrietta told me that he was one of a large party out last spring for the purpose of hunting game, and finding minerals, especially copper. He gave me very rich specimens of blue copper, (malachite), of which he said he saw beds of considerable thickness between sand rocks on the side hills of that region.

THE COPPER OF ARCHER COUNTY.

In the report of the General Land Office for 1869, p. 49, is a notice of the copper ores of this county containing some erroneous statements. It is said to be in the permian period, and that if this "formation were ever known to exist in Texas, it has been mistaken for the triassic system, which is overlying the former to the southeast." In a notice, which I gave of this copper in the Texas Almanac of 1868, it is stated that Archer county probably belongs to the permian. Many years ago Shumard reported that the permian was at the Guadalupe mountains, of Texas. It has never been mistaken for the triassic by any geologist of the Texas State survey, nor does the triassic overlie it at the southeast. I now think that Archer county belongs to the upper carboniferous. Certainly no permian fossils have been found there. It is also stated that the veins of copper are very numerous in Archer county, and have been traced over the summits and sides of the hills, so that hardly a tract of one hundred and sixty acres can be found without ore on the surface. It is supposed that these veins are contemporaneous with injections, at different periods, of quartz, trap and porphyry.

I have seen no veins of copper in the copper bearing strata of Northern Texas. Capt. Gant, of Weatherford, who is a very good geologist, and who knows more about the copper of Archer county than any other man, told me last September that he had not found any veins there. It is possible, and very probable, that true veins of copper are west of the eastern portion of Haskell county, but not east of it. In this region, the copper is in beds or concretions, both of these forms being quite common. It is here, evidently, a sedimentary deposit, the beds being nearly horizontal, or but slightly inclined. I have not seen any of the azoic igneous rocks in situ in that part of the State, nor are there any known injections or veins of quartz, trap and porphyry in Archer county.

In the northern part of Young county the red copper-bearing clay appears, and washed from it, on the surface, are loose masses of ore, containing a small per cent. of copper.

In several places, near the road from Graham to Fort Griffin, we saw outcroppings of copper in the clays at and near the base of the hills. This was in Throckmorton county.

In the vicinity of California and Paint creeks, in Haskell county, are loose copper ores on the sides and at the bases of the hills. The red copper clays near the head of Paint creek give color to its waters and have suggested its name. Still farther west, in Haskell county, the copper ores are more abundant and rich, the specimens from that region yielding about the same per cent. of copper as the best ores of Archer county.

South of Archer, in Jones county, between California creek and the Clear Fork of the Brazos, in several places, I saw the copper clays and loose specimens of ore in ravines and the base or on the sides of hills. As both Haskell and Jones counties are unsettled, and we had no county maps, it is impossible to designate localities.

The copper ore of Northern Texas ought to be smelted there. Coal abounds there, to which will soon be added railroads now in process of construction. Col. Stratton, who lives near the Red River, in the northern part of Clay county, suggests the following plan, which seems to be a good one: Let furnaces be made as cheaply and well as possible, combining all recent improvements; then let so much per ton be given for the ore, grading the price according to quality; then the inhabitants of that section will furnish the ore, for loose specimens will be gathered from the surface of that country by men, women and children, and wagon loads will be driven to the furnace from all directions. It is said that recent improvements will reduce the expense of smelting copper ore more than one-half. What was formerly a difficult work is now said to be simple and easy. Let this be as it may, more money can be realized from the working of the ore into copper at home than by taking the ore north to be smelted. Manufactured in Texas, it would aid in the settlement of the copper region, which is also a fine agricultural country, and then the frontier protection now required would not be needed.

COPPER OF LLANO COUNTY.

On the Little Llano, near the northern boundary of the county, are some large veins of ore, containing a large per cent of copper. These veins are, some of them, from two to three feet thick in granites, and their associated crystalline rocks also. The veins extend into the metamorphic rocks, gneiss and mica schist. Surface specimens show a large per cent. of iron mixed with the copper. It may be that downwards the ore will contain a larger per cent. of copper than is now given.

A few miles west of this copper, ore of a similar character has been found in veins. A Mr. Tharp has been mining for silver and copper during the present season at a place near his house, about four miles west of Packsaddle Mountain. He has found some fine specimens of blue copper, but had not, at time of our visit (October) succeeded in finding a true vein. He is working in feldspathic granites, composed mostly of feldspar, considerable quartz, and but little mica. On the surface, near the road from Llano to the cove of Honey Creek, about three miles from the latter place, I saw specimens of copper ore, to which my attention was called by Dr. C. S. Smith, of Llano. These were on the surface of the metamorphic mica schists, and if a true vein is there, it will probably prove to be very valuable.

In the State Cabinet are specimens of copper ore which are said to have been obtained from near Eagle Pass.

The copper ores of Texas give promise to be next in value to its deposits of iron and coal. Westward and southwestward from the present known copper region, there are probably richer beds and veins than any yet known. Such are the geological indications.

Last winter Dr. Beaumont, of the State Department, gave me a specimen of native copper, which he said was found in Northern Texas. Its finder reported such copper to be quite abundant in that portion of the State. I do not think it was found east of Haskell county. It may have come from the Lake Superior region, the specimens of which it much resembles.

LEAD.

Lead has been found in small quantities in Llano county, where it is associated with silver. At an old Spanish mine, not far from Honey creek cove, near the top of a mountain a few hundred feet high, mining appears to have been done for both lead and silver. The mine is in the calciferous sand-rock, associated with the magnesian limestone of the lower silurian. Large rhomboidal crystals of calcite are abundant near the entrance of the mine. These are sometimes termed the "blossoms of lead," by some miners in Missouri, where lead is found in the same geological formation. A piece of slug, given me by Dr. C. S. Smith, of Llano, who obtained it at the old furnace, where the ore was smelted, contains lead, which has been smelted. Around the entrance of the mine are some rocks which contain titaniferous iron ore.

Mr. Magee, a few years ago, had the water drawn from the mine, which is said to be forty or fifty feet deep, but from some cause unknown to me, nothing more was done at that locality.

A Mr. Woodward, who lives on Cherokee creek, in San Saba county, lately showed me some fine specimens of galena, which he said he obtained not far from his residence, but he refused to designate the spot, hoping that ere long he would be able to buy the land on which the mine is situated. Here the lead occurs in the same kind of rocks which contain the Spanish mine of Llano. Mr. W. said that he knew the lead ore at his place to be very abundant, also saying that he was familiar with the lead-bearing rocks of Illinois and Missouri, having there lived near the mines.

In Burnet county, about four miles from Bluffton, is a lead and silver mine, which has been worked to some extent. Several specimens of ore from this mine are in the State Cabinet. Working at this place has been discontinued, its owner having been engaged in digging for silver in Llano county during the past summer. The ore near

Bluffton is so much disseminated through the rocks, it is said that its working did not pay well. It is also reported that the working at the mine will be renewed, and perhaps then richer and better veins will be found.

From Western Texas, rich specimens of lead ore are in the State collection. These were sent to the State survey before the war, during which their labels were lost. A specimen of it, rich in silver, has been stolen from the collection during the past year. I allude to this, because, when in Llano county last October, I was told that a man had shown specimens there to certain parties, some of whom remembered to have seen the same specimens in the State cabinet; hence the rich specimens of silver and lead ore, said to have been recently found in Llano county, may have belonged to another part of the State.

Dr. Hunter, of Palestine, in Anderson county, who was surgeon of a regiment, or part of a regiment, which passed through Western Texas far out towards the Rio Grande. On this route he saw at two different places, in the rocky sides of the mountains, ledges of rich galena. These were in the vicinity of a certain old fort, which is now unoccupied. Dr. H. pointed out the places on the map, and he feels confident he could again find them.

From the limited knowledge we have of the geology of this portion of Texas, obtained from the Mexican boundary survey and other sources, there is little doubt of there being the same geological formation in the far western parts of the State as that of the rich lead and silver mines of Mexico.

In many of the old settled counties, we have reports of lead ores having formerly been known; so rich that lead for bullets was there obtained by the old hunters. Such things are now told in some counties where it is useless to expect to find lead ores.

Parson Watkins, a Methodist preacher, living in the northern part of Nacogdoches county, last summer told me that he knew there was a rich lead mine in Sabine county, not far from the town of Milam, in the Polley neighborhood, on the farm of John C. Burroughs, on a creek called Mine creek. The father of Parson Watkins was one of the first settlers of Sabine county. He was informed of the mine by an old Mexican, and finally, after repeated hunting during two years, he succeeded in finding it. The parson said that, when he was a boy, his father came home one day laden with lead, saying that he had found the mine, and subsequently, whenever he wanted lead, he would go to the mine and bring the ore home and smelt it. This the parson well remembers. But his father died without telling where the mine is, more than he revealed to his son on his death bed, telling that it is at the base of the bank of the creek, in a field now cultivated. The creek has low banks, which have been ploughed nearly to the water's edge; so the ore is covered with earth, and the parson cannot find it, nor any one else. The parson is a middle-aged, healthy, intelligent man, and he certainly can have no motive for misrepresenting. I have not been in Sabine county, and was going northward when I met the parson, near whose house we encamped at night.

The old limestones of the lower silurian, in Burnet, Llano and San Saba counties, have lead ores, as we know from authentic specimens received from that region; also the metamorphic rocks prevalent in those counties may have both lead and silver. These are gneiss, mica, schist and hornblende slates.

GOLD

has been found in small quantities in the sands and schistose rocks of Llano and Mason counties, where there has been much labor given to obtain it. In the spring of 1861, I succeeded in getting a little gold from quartzose veins in mica slates, on the banks of the Llano river, about eight miles south of Fort Mason. Recently, in Llano county, on the banks of Sandy creek, I saw Dr. C. S. Smith pan out a very little gold from pulverized mica slates traversed by quartzose veins. This shows the native beds of the gold found in the sands of Sandy creek. Numerous ravines through these metamorphic rocks empty into the creek, bringing down the golden sand; hence we need not expect to find gold in the granites and their associated crystalline rocks, but rather in the still older metamorphic rocks, gneiss, mica schists, etc., which generally underlie the granite, or are in close proximity to it. Mining experience teaches this. Dana, in his Manual of Geology, page 413, in alluding to the paleozoic age, says: "Much of the gold of the world comes originally from rocks, which were metamorphosed and filled with veins at this lime. The same is believed to be true of platinum and diamonds. None of the precious metals are yet known to occur in the crystalline azoic. Some of the veins of tin, copper and lead, and mines of topaz, emerald and sapphire, are among the productions of this epoch of metamorphism." A knowledge of this fact would have saved thousands of dollars of useless expenditure in Llano and other counties, in digging and blasting into granites and other igneous rocks. Much of such work has been done the past season. A gentleman, who said he was part proprietor of a silver mine near Babyhead Mountain, in Llano county, told me last summer that he had traced the silver vein to the base of the mountain, and up and over it, the vein passing through to the other side. Last October I was at this mountain; passed over and around it; found it granite, with a few veins of quartz and feldspar; but could see no silver, nor any signs of it. Much search has been made, and many excavations made in the granites of Burnet and Llano counties. Even now many believe the Enchanted Rock mountains of Llano to abound in gold and other precious metals; but as these mountains are all granites and their associated igneous rocks, they afford little promise of gold or any other precious metal. No large amounts of gold have been found during the last thirty years in the rocks or sands of Texas. Some, in washing the sands of Llano county for gold, have made on an average about fifty cents a day.

SILVER

has been noticed to some extent under the heads of lead and gold A few years ago, several statements were published of a rich silver mine in Llano county, near the base of Babyhead Mountain, in the northern part of the county. The ore was reported to yield on an average about $240 to the ton. It may have been more; I write from memory, feeling sure that the amount is not overstated. Such yields of silver pay well, and it was published that this Llano mine was being worked and its ore shipped to New York to be smelted. It was also stated that preparations were being made to smelt the ore at home. This silver mine was expected to cause the town of Llano (eight to ten miles distant) to improve rapidly.

I visited this locality last October. No work was being done there, and very little had ever been done. This surely would not have been, had the mine been as rich as has been represented. I could not there find a good specimen of either silver or lead.

Again it was published in the newspapers last summer, that rich silver mines had been found in Llano county, at a place a few miles east of Babyhead Mountain, near the headwaters of Little Llano river. Some of the ores here were said to have $900 in silver to the ton—an uncommon richness.

I did not visit this locality. Mr. Johns, of Austin, one of the proprietors of these mines, has specimens from there of silver, lead and copper, which are now before me. These will yield a large per cent. of these metals. The only question as regards the value of the mine is: do such ores abound there in large quantities? If they do, it is one of the richest mines in the United States.

It was also published last summer that tons of silver ore were being sent from Llano county to the North to be smelted. If so, where was the ore obtained? to whom was it sent? and by whom smelted? and what was the yield per ton? Some of the well informed people of Llano know nothing about it, and they even doubt whether it has been done; hence it behooves those who own these silver mines, and have caused such statements to be published, to answer the above questions.

So much cheating has been done by speculators in buying and selling mines in the Rocky Mountain States during the past few years, that now well informed capitalists require strong proof before investing in mining property, and one of the strongest proofs that can be given is, by smelting large quantities of the ore, and also, by showing that the ore can be obtained at the mine abundantly, and for a long time.

Mr. Barnett and Dr. Watson, of San Saba county, gave me some specimens which may be stephanite, a black silver ore, containing a little sulphur and some antimony. These specimens are in an unopened box of minerals, and have not yet been tested, for want of time. These gentlemen found this ore in Mason county, and report a very large deposit to be there, forming a large portion of a hill. Messrs. Barnett and Watson said the ore had been tested by Dr. Westfall, of the State Senate, and that the Doctor reported it to be an antimonial silver ore. If so, the mine will be of immense value.

TITANIFEROUS IRON.

Various forms of this occur frequently in Llano county, and have been mistaken by many for more valuable minerals. Ilmenite is quite common, and has been mistaken for silver, and even for platinum. A teacher of chemistry reported it to be platinum, and he felt so confident that he was right, that he persuaded a few others to join him and buy several hundred acres of the Llano county mountains. This was done secretly and as quickly as possible, to make sure of the thing which was to give an immense fortune to each member of the company.

Throckmorton was then Governor, and I was his geologist. One of the members of the company who had invested $500 in gold in it, brought some specimens of the ore to me for testing. It being an old acquaintance, I told him at once what it was. This caused him to swear, for he loved money, and could ill afford to lose it.

BISMUTH.

A bed of this ore is said to be near the Little Wichita, in Archer county. Specimens from there were given me by Gov. Throckmorton, several years ago. A large bed of this ore is said to be there. It is a valuable mineral, being used to form alloys with tin, copper and other minerals. As yet it has not been found in any considerable quantity in the United States.

ZINC.

Ores of this metal are also reported to be in Archer county.

STEATITE OR SOAP STONE.

On Comanche creek, near Comanche mountain, in Llano county, are extensive dykes of hornblende rock, enclosing large masses of soap stone. One of these veins of steatite is about three hundred feet wide, extending in a westerly direction towards the Hondo creek, where, at the distance of eight miles, it appears again.

There are other beds of this rock in the mountains, on Sandy creek, about ten miles from its junction with the Colorado river. It has a bright gray color, a fine grain, and a very compact texture, yet so soft, as easily to be cut with a knife, or sawed into thin boards. It is an excellent material for the construction of furnaces for smelting iron or copper. It makes good fire places, ink-stands and griddles; these last do not require any grease to keep buckwheat or any other cakes from sticking. It can be used for fence posts, as is done in some parts of New England. Pounded fine, and mixed with a little grease or tallow, it forms a very durable article to lessen friction in the axles of wagons and carriages. To obtain it for this purpose, wagoners come trom a distance and consider it to be neater, better, and more lasting for that use than any thing else. Some one will make a fortune by making axle grease from these soap stones of Llano county.

MARBLES.

The lower silurian rocks of Burnet, Llano and San Saba counties, contain some fine marbles of various shades of color; white, black, flesh color and clouded, which would be extensively used if near railroad or water transportation. These marbles, as far as known, are not equal to the best, but of very fair quality.

OTHER BUILDING ROCKS.

In both Burnet and Llano counties, are fine granites; also, gneissoid rocks, suitable for buildings or monuments, being of a quality equal to the best of any country. Superior limestones for buildings also abound there, and also in San Saba county. The limestones and sandstones of all the counties in the carboniferous region will furnish an inexhaustible supply of good building material.

In the north-eastern part of San Saba county is a sandrock, which has been used to some extent for the manufacture of grindstones. About eight miles west of Weatherford, in Parker county, is a light gray, compact sandstone, resembling in appearance a fine grained granite. It is manufactured at Weatherford into grindstones, and also, for the foundations of monuments. It is also an excellent building rock. The supply is said to be ample for all purposes.

Many of the cretaceous limestones also furnish an excellent building material. The Austin limestone has been, and is being largely used for building at Austin. This limerock extends northward to the Red River. Last summer it was being used in the building of courthouses at Paris, in Lamar county, at Sherman, in Grayson, and at McKinney, in Collin county.

In Eastern and Central Texas, there is a reddish brown sandrock, used by the International Railroad Company for the stone work of their road. It has also been largely used for chimneys, for this purpose being much better than brick. It is colored by the red oxide of iron, is fine grained and compact, forming more beautiful walls than the browd sandstones of Connecticut and New Jersey, which have been so largely used for building purposes in New York and other cities. The Texas rock prevails in the iron region of the tertiary. Mountains of it are in Milam, Robertson, Cherokee and other counties.

ROOFING SLATE.

In the bank of Honey creek, near Packsaddle Mountain, is a slate rock, which probably belongs to the laurentian period, it being older than the potsdam sandstone, which overlies it. It is very similar in appearance to slates of Vermont and New Hampshire, which are used for roofs. We only obtained outside specimens of it, and those are not of sufficient firmness for roofs. It is highly probable that the interior slates are more hard and compact. This rock prevails in the region around Packsaddle in strata, dipping at large angles, often being nearly perpendicular, it having been uplifted from its original position by the upheaval of the granite.

HYDRAULIC LIMESTONE

which forms a cement which will set or become firm under water. It is an impure limerocks composed of lime, clay sand and magnesia, to which is added, in the best cements, a little iron.

An analysis made by Beck, of an excellent kind, found at Rondont, N. Y., gave the following composition :

Carbonic acid	34.20
Lime	25.50
Magnesia	12.35
Silica	15.37
Alumina	9.13
Sesquioxyd of iron	2.25

There is little doubt but that many of our silicious and magnesian limestones will make good cements, to form which it is not necessary to have rocks composed of the exact proportions given in the above analysis.

GYPSUM,

which is a sulphate of lime, occurs in small quantities throughout the limestone region of the State, whatever may be the geological formation, gysum being in the silurian, carboniferous, cretaceous and tertiary periods. To its wide dissemination, the great fertility of our soils is largely indebted.

On the headwaters of the Red River and its tributaries, is one of the largest gypsum formations known, extending for hundreds of miles, and affording inexhaustible supplies. Gypsum in all its forms is here, alabaster, selenite and all the coarser varieties. To the State it is worth more than the richest gold mine, for, by a liberal application of it to the sandy soils of the State, their fertility will be more than doubled. More will be said about this in the Agricultural Report.

SALT.

West of Corpus Christi, towards Brownsville, are many large and small shallow lagoons or arms of the Gulf, which, during the prevalence of winds blowing inland, joined with the tides, are filled with salt water, which is there evaporated, depositing the salt at the bottom in small crystals. At ebbtide, the salt is left dry, and is then collected for use. It is often ground before using. Large supplies are thus obtained.

At Jordan's, or Grand Saline, as now called, in the southern part of Van Zandt county, are large salt springs, or rather wells, in a valley of several hundred acres. During the war many wells were sunk here, and about 1000 sacks of salt daily made. Each sack has about 200 pounds. Now but one well is used, the supply of water from this being ample to make to make about fifty sacks a day, which is the average amount now made. To obtain the water, wells are dug through a sandy soil about eighteen feet, at which depth a quicksand is met, at the bottom of which is a hardpan, out of which the salt water flows strong and fast, the supply being unlimited. One gallon of the water makes one pound and one-third of a pound of salt. An analysis of the water gives fourteen per cent. of chloride of sodium, the chemical name for salt. The water also has a small per cent. of iron and sulphate of lime and a trace of magnesia.

A very white and good looking salt is here made, which is sold at the works at prices ranging from $2.50 to $3.00 per sack, $3.00 being asked for one sack, and $2.50 for a larger quantity. At the time of our visit forty-two large kettles were full of the boiling water.

This saline is a little more than one mile from the Central Pacific Railroad, and one hundred miles east of Dallas. It is one of the finest salines known, affording a much larger supply of water than the Salt Springs at Syracuse, N. Y., which have largely contributed towards making a large city. The Grand Saline is in the tertiary, near the eastern border of the cretaceous.

At Graham, in the southern part of Young county, on the Salt Fork of the Brazos, are salt works, owned by the Messrs. Graham, of that place. At the town of Graham, the banks of the Salt Fork for the distance of about three-fourths of a mile, in times of low water, are whitened near the water's edge with salt. The incrustations of salt in a dry time extend across the stream. Water of considerable saltness is here obtained from shallow wells. To get stronger water a well has been sunk or bored, of which the following is a section of the strata passed through:

1.	Sandy loam and earth	16	feet
2.	Blue sandy clay	3	"
3.	Gravel, with quicksand	8	"
4.	Conglomerate	16	"
5.	Superior cream-colored fireclay	8	"
6.	Yellow, bluish, white, soft sandstone	10	"
7.	Harder yellow sandstone	5	"
8.	Coal	1	"
9.	Coarse, yellow, soft sandstone	4	"
10.	Hard quartzose conglomerate	13	"
11.	Fireclay, bluish	42	"
12.	Compact, hard, brown clay	5	"
13.	Very brown sandstone, porous, and filled with gas	5	"
14.	Clay and slate	9	"
15.	Very hard brown clay	8	"
16.	Fireclay, varied blue and yellowish	148	"
17.	Fireclay, with thin strata of shale	70	"
18.	Very hard dark brown or black slate abounding in gas	8½	"
19.	Red shale	10	"
20.	Sandstone	1½	"

The strength of the water increased with the depth ‘the supply being inexhaustible; gives water from 22 to 25 per cent.; clean white salt of the best quality.

At the time of our visit (September, 1874), the making of salt had been suspended, one of the Graham brothers having gone north to get new machinery for the works.

In the southern part of Wise county, salt is being made by a Mr. Fitzgerald. His works have been recently established.

Beds of salt are reported as being in the gypsum region of the Red River ; also near the crossing of the Pecos, on the route from Fredericksburg to El Paso.

From the preceding it will be seen that Texas has more, and much more, than sufficient salt for all her wants now and forever.

At Swenson's saline, in the western part of Lampasas county, salt was largely made a few years ago, and also at a saline in the eastern part of Llano county.

PETROLEUM.

A few years ago boring was made for petroleum in Nacogdoches county, about six miles south of Melrose. Here are several oil springs, from which the oil flows and spreads itself upon the surface of the water. From the surface of a shaft well, about one hundred feet deep, we obtained a bottle of the crude oil, which is very like that which flows from many of the oil wells of Pennsylvania. The indications at the surface springs, coated with oil, are much better for petroleum than is generally seen in the oil region of Pennsylvania.

The Nacogdoches springs are at the base of sandstone hills of the tertiary age. The oil flows from a bluish gray, shelly marl, at the base of buff sandstones, three to five feet thick, abounding in tertiary shells. When the supply is more limited, and the value of petroleum greater than now, it may pay, and pay well, to bore for petroleum near Melrose.

During Governor Throckmorton's administration, I visited some oil springs in the western part of Bell county, which were also coated with oil to some extent, but the supply was not as abundant as near Melrose. It may be proper to add, that the boring done at Melrose was by a Northern man, well posted in the oil matters of the oil springs of Pennsylvania. He bought a large tract of land in Nacogdoches, and died during the boring of the well above named; and then the work ceased and has not been resumed.

Asphaltum, in limited quantities, flows from the crevices of limestones in Travis county, north of Austin, and also from similar rocks near Burnet, in Burnet county. The supply is too limited to be of any commercial value, or to encourage boring for oil. Near the top of Gordon mountain, in Montague county, are some beds of asphaltum of small extent. These are in the cretaceous limestones.

Near Sabine Pass, and a few miles east of it, the oil is said to flow so plentifully as to make the sea calm to a considerable distance, even, during storms. A few miles north of this, at Sour Lake, are also oil springs, where oil floats upon the surface of the water.

EPSOM SALTS.

In Cooke county, on Indian creek, about eight miles southwest of Whitesboro, epsom salts (sulphate of magnesia) was manufactured largely during the war. A number of wells were there sunk to the depth of about sixteen feet, from which plenty of strong water was obtained for manufacturing on a large scale.

COPPERAS

was also made in large quantities on Copperas branch, four miles north of Whitesboro. At this branch, there are bluffs of alum shales, containing alum, sulphuret of iron, and fragments of coal. About five hundred pounds a day of copperas was here made during about two years. From here, nearly the whole State was supplied. A few hundred pounds of alum were also made at the same place.

SALTPETRE—NITRATE OF POTASSA

abounds in caves in Burnet, San Saba, and other counties to the west of them having caves in the limestone region. In the western part of Burnet, a few miles from Bluffton, on a high hill, there is a cave in the lime rock of the lower silurian. Its entrance is about fourteen feet in diameter one way and ten feet the other, down perpendicular about twenty feet, at the bottom of which the opening, about ten feet high, goes onward nearly horizontally in several directions to an unexplored extent. During the water, saltpetre was extensively made from the manure of bats obtained from this. The refuse from the manufacture still lies in large heaps at the place of manufacture, near the entrance of the cave. Wishing to explore and measure the cave, I was joined by several men and boys of that neighborhood. Down we went, each with a candle or torch to light the way, and I also a long tape line and assistant to measure the distance. On we went, taking the main entrance, from which most of the material for making saltpetre had been obtained, it being the largest. At the distance of about three hundred feet, we entered a large avenue to the right. We found the odor from the bats very unpleasant. Straggling bats flew around us, inquiring why we were there, and large clusters of bats were on the sides of the walls and overhead. Presently, when the ceiling above came within six to eight feet of the ground, the bats became alarmed, and flew in such crowds around as to put out the lights of most of our party, causing us all to retreat hastily and abandon the idea of further explorations. The next day I went with a gentlemen of that neighborhood to see the bats issue from the cave to begin their night's work. When the sun was about half an hour high, we arrived at the entrance of the cave. About ten minutes before sunset a few bats came forth to reconnoitre and see the time of day, and, after doing this, back they went to report; five minutes later, a few came forth, rising twenty-five to thirty feet above the ground, and off they went with an undulatory motion in a more horizontal direction. Thicker and faster they came by thousands, circling round and round until high above the ground; then away they gaily went over hill and valley. At sunset the ascending column was so thick that the flying bats nearly touched each other. They came forth by millions. Never before had I seen such an exhibition of life—gay, active life. Forth they went, catching insects here and there by thousands and by millions; hence these bats are useful in destroying night-going insects, who hide by day from the birds. I was told that the people living for many miles around that cave were not troubled with mosquitoes, nor with many other night-flying insects.

I have been told of another bat cave, not many miles from Georgetown, in Williamson county. Others are also in San Saba county. All these afford material for the manufacture of saltpetre, which, in a crude state, is quite common under overhanging limestone rocks in San Saba, Llano, Burnet and other counties. Tons of bat manure are in these caves, which, if not wanted for making saltpetre, would be equally as useful as guano as a fertilizer. Even the refuse heaps left from the manufacture of saltpetre would be useful to feed the growing crops.

PAINTS, OCHRES, ETC.

In the northern part of Cherokee county, not far from Young's Iron Works, are beds of a fine grained, very white clay, which has been used to some extent in painting dwellings and outbuildings. At Rusk, we were shown the woodwork of some rooms, which had been painted with this clay, and, had we not been told, we would have supposed it to have been done with white lead. The clay was mixed in water and applied to the wood with a whitewash brush, and when dry the whole coated with oil, which sets the paint and prevents it from rubbing off. It is probable that most of the fireclays in the State can be thus utilized. For a whitewash, mix flour with glue dissolved in water; to this mixture add the white clay. Wash does not rub off.

Where clay forms a large proportion of some of the iron rocks of the tertiary as in some parts of Bastrop and other counties, ochres often result, yellow, red and brown of various shades. All these can be utilized in painting houses, agricultural implements, etc., etc.

Such are the minerals and mineral products of the State known to the survey, a large portion of which now lie dormant, waiting for capital and labor to move them. It is an inviting field, a rich field, which will give large fortunes to prudent, enterprising, industrious men.

MINERAL SPRINGS.

Chalybeate springs are common in the iron region of the tertiary—so common that they attract little or no attention.

At Lampasas, in Lampasas county, are some of the finest sulphur springs in the world. On one side of the town are two or three large bold springs of white sulphur water, so strong that the rocks overflowed are coated white. Another large spring is in the northeastern part of the town. This, at time of our last visit, in October, 1874, was less strongly impregnated with sulphur than the large one in the southwest part of the town. It is said that these springs, which are more than one mile apart, alternate in strength—when one has strong sulphur water, the other is weaker, and vice versa. Large supplies of water are at both places, for bathing, etc., and bath-houses for both ladies and gentlemen are there. Lampasas, with its clear waters, both fresh and mineral, its beautiful shade trees, elms, liveoaks, etc., river, hills, and varied scenery, is a delightful place of resort.

OTHER SULPHUR SPRINGS

are in Hopkins, Grimes, Rusk and other counties, all of which have their visitors, but not having seen these springs, I can only allude to them.

GEOLOGY—TERTIARY.

The line between the oldest tertiary (eocene) and the middle tertiary (miocene), has not been clearly defined. Southward we know that Bastrop county belongs to the eocene, and also that a large portion of Washington county is probably miocene. In this county, no fossils of the eocene have been found, excepting in its northeastern portion. The rocks of Bastrop county are mostly sandstones, a large portion of which are highly charged with iron. Some of these, having little sand and much clay, make good ochres, and these are not uncommon in some of the hills west of the Colorado river, not far from the old residence of Judge Eastland. These ochres are in quantities enough to be of commercial value.

Robertson county, and the other tertiary counties north of it, belong to the eocene. The prevailing rocks are sandstones; many of them have a large per cent. of iron, often gradually passing into iron ores of good quality. A buff sandstone, containing a small per cent. of lime, extends from the northern part of Bastrop county through Burleson into the eastern part of Milam; is occasionally met in Robertson and also in Cherokee, passing eastward into Nacogdoches, and northward into Rusk county. It has a thickness of from four to about eight feet, varies in hardness, generally being rather soft and friable, abounds in fossil shells sometimes to such an extent as to be useful as a marl or fertilizer, as is seen on some hills near Col. Durant's, near Centreville, in Leon county. This rock is also in the hills of the petroleum region, near Melrose, in Nacogdoches, and is there by many, erroneously, supposed to belong exclusively to the oil-bearing rocks.

The rocks of the older tertiary are sedimentary deposits, including also the iron ores which often lie in beds or concretions in clays and sands. The deepest wells at their greatest depth generally have sands or friable sandrock, from which the water flows.

The following section is on the railroad cut east of and near Mineola, on the Texas Pacific railroad, in the northern part of Smith county :

1. Light sandy surface soil	1 to 2 feet
2. Buff-colored sandy clay	3 “
3. Reddish brown, sandy, compact clay, mottled with light gray sand	16 “
4. Half-formed conglomerate, with angular and rounded pebbles—reddish brown and yellowish white	18 inches

This is not permanent ; sometimes hard light clay and again a compact light jointed clay takes its place. Sometimes concretionary iron ores abound in these clays, which, however, are not strong clays, sand largely predominating.

The town well at Mineola, thirty feet deep, is through a mixed soil, varying from a yellowish light gray to a dark brown. Water abundant, but strongly mineralized with soda, copperas, alum and magnesia—hence little used.

There is a large spring of excellent water at the edge of the town, besides most of the other wells in the neighborhood out of town have good water, showing the formation in which the town well is sunk is not extensive.

Most of the wells south of this in the tertiary as far south as Robertson county, and including that county, also pass through sands and clay, or alternating with sandrocks and iron ores—the sands and clays generally so hard that the wells do not need curbing, the water being found at a depth of from fifteen to ninety or more feet, most wells being from twenty to thirty feet deep. Many of them pass through coal beds. Where the coal is not charged with sulphur, alum, etc., the water is good, as is exemplified in the wells at Head's Prairie, in Limestone county.

As before said, the strata are nearly horizontal, the inclinations being no more than can be accounted for from depositions being made on inclined surfaces in the water or elsewhere. No signs of igneous forces, from the fires of the interior of the earth, are known in the tertiary rocks of Texas, as far as the survey has extended. Some of the iron ores, on account of their smooth, shining surfaces, bright colors and blistered appearances, are supposed by many to have been once melted, but this is not so; they are aqueous depositions.

Many years ago, I visited the iron mines at Salisbury, Connecticut, which were worked during the last century, more than one hundred years ago. I was told that in wet places, at the foot of hills, the earth which had been once worked over, then again yielded a fresh supply of ore, affording some beautiful specimens of hæmatites, showing all the colors of the rainbow, some of them looking as if they had been melted; but they were mere aqueous deposits in sands and clays. In the same manner iron ores are now being made in some of the tertiary of Texas. The work is not finished; nature still keeps her chemical and attractive forces busily employed.

During Gov. Throckmorton's administration, in the eastern part of Milam county, about five miles from the Brazos, I obtained the following section of the well of Mr. Caleb Pendaris:

1.	Surface soil, yellow sand and clay	2	feet,
2.	Hard, yellowish clay	28	“
3.	Coal bed	10	“
4.	Yellow clay, very compact and hard	20	“
5.	Coal	4	“
6.	Blue clay	10	“

To water, which is not of the best quality. Coal pretty good, containing in the upper and lower parts of the bed a few small crystals of selenite, and also some seams of sulphuret of iron.

In a ravine near there is the following section:

1.	Surface, dark loam	3	feet.
2.	Clay and sand	4	“
3.	Pale yellow and blue shales	10	“
4.	Coal	8 to 10	“
5.	Fire clay and black shale to the bed of the stream	8	“

A conglomerate on the hills near, contains water-worn cretaceous fossils, exogyra, gryphea, etc. The cretacious rocks are but a few miles to the west and north.

Fossil wood abounds on many of the hills, and also in the valleys of the tertiary region. In the southwest corner of Burleson county, near the Washington county line, and probably extending into that county, in the summer of 1860, I saw many prostrate petrified trees lying on the surface. The petrifaction was done after the trees had fallen and been broken in many places. I measured one of these, which extended along the ground upwards of fifty feet, and had a body nearly two feet in diameter. In the bank of a ravine, in Fayette county, I measured a fossil stump which is six feet in diameter, and six feet four inches long. It is on Indian creek, twenty-five feet beneath the top of the bank, not far from the stage road between LaGrange and Bastrop, and half a mile above Mr. McDowel's, in Fayette county. This is probably much larger than any trees now growing in that neighborhood. This tree, when alive, was larger than it is now without its bark and a portion of the outer wood, and proves that trees, a long time ago in that portion of the State, were fully equal, and perhaps greater in size than at present. The tree is exogenous, and in the eocene not far from a coal bed.

Petrified wood also abounds throughout a large portion of the cretaceous of the State.

Many instances are told of wood having been petrified after it had been cut and used. The foundation blocks of a school house in Harrison county are said to be petrified. The dead part of a growing tree is said to have turned to stone. It may be so, but I have seen no positive examples of petrifactions having been made during the last twenty-five years.

In the northwestern part of Grayson county, and the southeastern portion of Cook, extending north to the Red River, is a tertiary which may be miocene, or the middle tertiary. It is in what is called the upper cross-timbers, the country there being timbered with oaks, elms and other trees; post-oaks constituting about three-fourths of the trees. Here are sandstones, iron ores and brown coals,

On Hickory creek, in Cook county, about ten miles northwest of Whitesboro, is an iron sandstone of various shades of reddish brown, which extends along the creek several miles. It is abundant, and makes a very fine building stone, being used for chimneys in Whitesboro and other places.

This tertiary probably extends as far south as Dallas, west of which is a narrow belt of the cross-timbers in which are sandrocks, coal and iron ores, containing a small per cent. of iron. Not having found any fossils there, the matter is left in doubt.

However, at and near Whitesboro, tertiary shells are abundant; ostreas, pectine, and many gasteropods in both the sandstones and limestones of that region, all of which are quite easily broken. The tertiary at Whitesboro is 12 to 14 miles wide, extending westward to the cretaceous, three miles east of Gainesville.

There is probably another tertiary region in the lower cross-timbers, which have trees similar to those of the upper cross-timbers.

The eastern boundary of the cretaceous, in Montague county, is near the foot of the Gordon mountains, which are also cretaceous. These mountains are about eight miles south of the Red River.

Westward from there, to the distance of twelve or more miles, is a sandy region with a few sandstone hills, some rocks colored to reddish brown with iron, and others light gray, compact and hard, resembling limestones in the distance. Did not succeed in finding any fossils in these hills, which extend southward as far as the town of Montague. In the cross-timbers, which are south of this, and also southwest to the southwest corner of Montague county are sandstones and iron rocks, much resembling the tertiary. These are seen near Judge Marlett's, in the southwest corner of Montague, near which is also the carboniferous.

A few miles west of the Gordon mountains, a well, sixty feet deep, was dug last summer, passing through hard, compact, sandy clays of a light gray and brown color, so compact as not to need curbing. No fossils there, and water good and abundant. From what Judge Marlett told me, it is probable that the upper and lower cross-timbers meet in the county of Denton. If so, there was a forked arm of an inland sea in the northern part of the State, after the upheaval of the cretaceous, and during the formation of the tertiary.

Of the newer tertiaries, in the southern part of the State, we have very few fossils.

In Washington county, near the Brazos, are bluffs and hills of hard siliceous limestones and sandstones, some of which are good for building purposes. Extending westward, at LaGrange, in Fayette county, the same kinds of rocks are seen in bluffs. In these rocks we have been able to find but few fossils, the only instance being in 1861, when I found a few of a bivalve (meretrix) in a sandstone on the banks of a small stream, near the centre of Washington county.

Near Independence, in the same county, is a white sandrock of great hardness, which is used for building in the town. It contains a few fossil leaves similar in outline and venation to those of the live oak, now growing in that region.

Along the southern border of Yegua are extensive beds of a clay, forming bluffs, so white as to resemble chalk hills. It is, however, nearly destitute of lime, being a silicate of alumina, and very similar in its composition to the white clay of the so-called chalk bluffs in Hickman county, Kentucky, on the banks of the Mississippi river. It is also similar in its composition to a white aluminous earth in Missouri, below Cape Girardeau, which is also on the Mississippi, from which a self-glazing and very beautiful ware is made.

The following is an analysis of the Yegua clays:

Volatile matters lost by heat	12.00
Silica and insoluble silicate	67.00
Alumina	14.00
Silicate and carbonate of lime, mostly the former	5.00
Magnesia	1.00

The large proportion of lime and alumina in these clays indicate that they may be liable to fuse at a very high temperature. This may be possibly remedied by mixing a larger proportion of siliceous material with them, and by regulating the temperature with great caution during the process of glazing.

Similar deposits to those of the Yegua are east of the Brazos, in Brazos county, and they also extend southwestward to Gonzales and Guadalupe counties, where are very large deposits of them, sufficiently large to supply the world with good porcelain, should experiments prove them suitable for that purpose. It is probable that they will thus be utilized, and, if so, rendered very valuable.

At Damon's mound, near the northwest corner of Brazoria county, in the southern part of the State, there is a large deposit of carbonate of lime, abounding in beautiful crystals of calcite, and also of aragonite. The mound is several hundred feet long and about thirty feet high, large enough to afford a supply of lime to the inhabitants of that region. Westward, in Live Oak county, near the county seat, I saw a similar formation along the banks of streams. It is also said to be at other places on a line between these two localities, forming a low ridge about fifty miles from the coast. All south of this ridge is probably post tertiary.

In the northeastern part of the State the tertiary extends westward nearly to Clarksville, in Red River county, with similar rocks, ores and soils to those already described as being in the counties south as far as Robertson county.

The eocene of Texas, as seen in the counties of Bastrop, Robertson, Leon, and thence along the eastern border of the cretaceous, northward to Red River county, belongs mostly to the lower eocene, as seen at Claiborne, Alabama, and in Clark county, west of Claiborne. The species of fossil shells common in Texas, especially in Bastrop county, on the banks of the Colorado, near Mrs. Gazeley's, are ostrea sachformis, pecten Lyelli, astarti Conradii, cordita planicosta, turritella carinata. Here we have some which are also found in Mississippi—urtica, voluta, dumosa, and several gasteropods, as yet unknown to me. Many years ago I made large collections of fossil shells at Claiborne, Alabama, and also in Clark county of that State, about the time I obtained the Zeuglodon skeleton, noticed in Lyell's Elementary Geology, and also described by me at that time in several articles published in Silliman's Journal. I have often recognized the similarity of the Texas eocene fossils to many of those common at Claiborne, Alabama.

In Washington county, at a depth of from sixteen to thirty-five feet, in digging wells, a marl strata is met containing bones, mostly of small animals, teeth the most common. About two years ago, at the request of Dr. Leidy, of Philadelphia, I sent a portion of them to him, he promising to return them, which will probably soon be done, with their correct names.

Near Hidalgo Falls, on the Brazos river, in the same county, in the banks of the stream, bones of the mastodon, mammoth and other large quadrupeds were found about fifteen years ago in great abundance. A large collection of these was made by Doctors Rucker and LeGrand, of the town of Washington, in that county.

It is said that the collection of Dr. Rucker was partly destroyed by fire a few years ago. Many years ago, the skeleton, nearly entire, of a mastodon was obtained in the banks of the Brazos, near San Felipe. This was taken to New Orleans and burned during a fire in that city. Mr. Delany, of the House of Representatives, informs me that an unusually large tooth of the mastodon belongs to a man at Columbus, in Colorado county.

Mr. Roesler stated a few years ago that he had discovered a new species of the mastodon in the northern part of the State. A report of the discovery was published in the Texas Almanac a few years ago. This is a mistake; no new species of mastodon has been found in Texas.

CRETACEOUS.

The cretaceous rocks of Texas are mostly included in the following boundaries: beginning a few miles south of Austin, they extend northeast, not far from the eastern boundary of the counties of Milam, Navarro, and on northwestward to the Red River, passing through Red River county a little east of Clarksville; thence westward to the western part of Grayson and the upper cross-timbers, beyond which it includes a large portion of Cook, Wise and Parker counties; also most of Palo Pinto, Erath, Comanche, Hamilton and Coryell; the eastern part of Burnet; nearly all of Blanco; the southern part of Gillespie, south to San Antonio; thence eastward through Comal county to Austin. All the counties included in these lines are mostly cretaceous and most of their rocks are limestones, more or less fossiliferous. They were formed in sections of greater or less depth, as is shown by the sea shells imbedded in them. Their strata are mostly horizontal, or but slightly inclined, being the result of a gradual formation, largely made by shells great and small and coraline insects. Hence, throughout most of these counties, it is in vain to look for coal, or for gold, or silver in their fossiliferous limestones.

At Comanche Peak, in Johnson county, in the northern part of this State, and about one mile from the Brazos river, there is a fine display of cretaceous rocks. This "peak" is about six hundred feet high, above the bed of the Brazos river, and is a flat topped mountain, about one mile and a half long, and one-fourth of a mile wide. A portion of the hill, about two hundred yards long, is separated from the southern part by a gap about fifty rods wide, and its bottom about one hundred and thirty feet below the summit. The upper part of this northern portion, to the depth of about one hundred and fifteen feet, is composed chiefly of a white hippurite limestone, beneath which there is a bend of gray limestone, intercalated with strata extending about seventy rods west, which forms a lowes carpment containing great quantities of exogyra Texana, Holaster simplex, lima Wacoensis and others, to the depth of about thirty feet. Beneath this are massive beds, composed in many places almost entirely of the shells of gryphea pitcheri and exogyra Texana. These beds are about seventy-five feet thick. At the southern extremity of the peak, the gryphite beds are about two hundred feet thick, the specimens of gryphea pitcheri becoming scarcer in the ascending series, and rare at the top of the beds; the upper portion also containing exogyra Texana, janira occidentalis, lima Wacoensis, toxaster, Holaster simplex, etc., in small quantities. Above the gryphite bed are massive limestone strata abounding in hippurites, caprotina, etc.

The cretaceous rocks contain phosphates and other ingredients found in marls, which are used by agriculturists as fertilizers on barren soils, or soils which are little productive in the old settled and less favored States. In the cretaceous region of Texas these expensive methods of improving the soil will not have to be made, at least in the present age.

The account of Comanche Peak is copied from my report of 1866, and is what Roesler had published as his own in in the Vienna Journal, before alluded to in the history of the survey.

The gryphite bed of Comanche Peak extends northward through Parker county to the carboniferous ten to twelve miles north of Weatherford. In a northeast direction, through Wise county, the cretaceous extends to the valley of the Red River, north of Gainesville, in Cook county. This gryphite bed is five to six feet thick on the Clear Fork of the Trinity, about twelve miles east of Weatherford, near the road to Fort Worth; bed composed almost entirely of this one species of shell in a great state of preservation, the rock nothing but shells, not very strongly cemented together. This is well shown at a little water-fall near Mr.

C. W. Ligar's. Below the gryphite bed is a limestone four to five feet thick, containing ammonites and other shells, and below this a sandrock base not seen. This sandrock is yellowish white, destitute of fossils, and so soft that it can be easily worked. It much resembles, lithologically, the St. Peter's sandstone as seen in the banks of the Mississippi, near St. Paul, in Minnesota. This Texas sandrock is more useful than any other in Tarrant, Parker, Wise and Cook counties, in all of which it underlies limestone and gives rise to springs and streams of clear good water. When wells reach it, water is obtained in plentiful quantities.

About twelve miles northeast of Weatherford I saw thirty feet of this sandstone exposed in the bluff of a ravine, the base of the rock not being seen, nor is its thickness known, because wells go no deeper than the top of it, and it forms the base of many ravines. Above the thirty feet of sandstone lies more than one hundred feet of hard fossiliferous cretaceous limestones. This sandrock may be older than the cretaceous which overlies it.

At Fort Worth, I met with Dr. Van Zandt, of that place, who had previously addressed me a letter, asking advice in regard to boring an artesian well at that place.

An artesian well was recently bored to the depth of 450 feet about nine miles southeast of that town, the first fifty being an open well five feet across. "Water in abundance was found in sand, the water rising rapidly about 425 feet, at which place there was a bed of ground five feet deep, through which the water escaped. Then a square box tube was put into the drill (seven inches in diameter), and the earth thrown into the well around. Then the water rose to within twelve feet of the top, and now the water fluctuates from this to a point six to eight feet lower." He adds, "the water was found after passing through a stratum of hard limestone, composed largely of shells." He also states that about twelve miles up the West Fork of the the Trinity from Fort Worth, there is just such an arrangement of the strata as was passed through at the well, the sand below giving an abundance of pure soft water. This soft sand rock at Fort Worth, which is overlaid there by 400 or 500 feet of cretaceous limestones, is probably the same as the soft sandstone giving springs and streams to Parker and other counties.

North of Gainesville, in Cook county, this sandstone gives rise to some fine springs. It is so porous that water percolates freely through it. It is highly important for the people of these counties to know of this arrangement of the rocks of that part of the State, as a direction to them in obtaining a supply of pure water.

In the southern portion of the cretaceous are some of the finest and largest springs in the world—large enough to give ample water power for machinery, and rise to rivers and large streams. Such are Barton's Springs, near Austin, the springs near San Marcos, those at and near New Braunfels, and also above San Antonio, near the town. These springs are the uprisings of underground streams, which do not extend any farther north than the azoic region of the southern part of Llano and Mason counties, and probably not as far.

The greatest thickness of the cretaceous strata of the State is not probably less than 1500 feet.

The artesian well on the Capitol grounds at Austin was bored to the depth of 1160 feet, all in the cretaceous, at which depth the shaft used in boring broke, and is still in the well. An appropriation of $5000 or more, was made three or four years ago to defray the expense of extracting the shaft, and sinking the well deeper. The money was expended and the shaft is still in the well. It would have been much better to have bored in a new place.

At Mount Bonel, about three miles northwest of Austin, there is a fine exposure of cretaceous strata to the height of about 500 feet above the Colorado, which flows at its base. On the opposite side of the mountain there are several terraces, and also in the adjacent hills these ancient sea beaches are seen. At the base of some of the terraces of the mountains, farther westward, are heaps of shells, old oysters, etc., as well preserved as if they had been recently left by the retiring waters.

From the top of Mount Bonel is one of the finest views in this or any other country. The rapids of the river as it comes from the mountains several miles above, its tranquil flow at the base of the precipitous side of the mountain, and downward course to Austin, mountains to the west and northwest, prairie and farms and farm-houses in the opposite direction, and Austin far below in the distance—all form a succession of the most beautiful landscapes.

The cretaceous region abounds in fine scenery made by its mountains, rocks, streams and valleys, to which are added fertile soils, a delightful climate, plenty of good water and healthful breezes. These combine to make it one of the best countries in the world to easily and cheaply make pleasant homes.

TRAP ROCKS.

Eight or ten miles southwest of Austin there is a hill mostly composed of these rocks, several hundred feet high. It is called Pilot Knob. Some of the specimens of the rocks have a tendency towards the three-sided form, peculiar to many of the trap rocks of Connecticut and New York. Pilot Knob is surrounded with cretaceous rocks, but the base of the mountain and its junction with the cretaceous is covered with loose soil so as to prevent its being seen—hence I cannot tell whether the knob was erupted before the cretaceous or not.

In Rockwall county, there are several dikes of trap rock, about four inches thick, which, from their jointed appearance, have been thought by many to be artificial walls of the olden time. For a more particular account of these, see Prof. Burleson's report.

These rocks are of igneous origin, and often assume, to a more or less extent, a crystalline form, as is seen in the palisade rocks on the Hudson, above New York, the Giants Causeway, in the north of Ireland, and other places, these forms causing many to suppose them fashioned, made by men.

CARBONIFEROUS PERIOD.

The boundaries of this period, as far as known, have been given in the notice of the coals of that formation. Its rocks are limestones, alternating with sandrocks, clays and shales. The limestones are generally harder than those of the cretaceous, and of a darker color—light blue or dark gray. In the northern part of the State, their strata are nearly horizontal, and, when inclined, the inclinations can be indicated by small angles.

Overtopping the whole, on the hills and mountains of that section, is a conglomerate, of from five to twenty feet in thickness, composed, in its northern and northwestern locations, of large rounded and angular fragments of quartzose rocks of various shades of color; also, granites and other igneous rocks. Such pebbles are scattered over the low hills, and in some of the valleys of that region. Farther south, the pebbles of the conglomerate are smaller, as seen in Lampasas, Brown and San Saba counties. At the close of the carboniferous era, all of that formation was overspread by a thick deposit of sand and gravel, destroying all its animal and vegetable life. This conglomerate, or concrete as it may be aptly termed, varies very much in hardness, in some places crumbling to pieces when struck with the hammer, and in others being hard and difficult to break.

Some of these last would make good building rocks. The section of the salt well at Graham, in Young county, shows two conglomerates, but this does not convey a correct representation of the strata of that region; because this salt valley was formerly much deeper than now, and has been filled by the crumbling of the mountains around, and at the base of one of these is the salt well.

A fusilina limestone overlies the coal of Young county, and extends as far south as Brown and Lampasas counties. I saw specimens of it a few miles west of Brownwood, the county seat of Brown county, and also in limestone rocks in the bed of Lampasa's river, at Lampasas Springs. The old carboniferous species of shells dwelt in groups to a considerable extent; in some places, Productus Rogersii were seen in multitudes; in others, Athyris subtilata, etc. Spirifer cameratus abounds in the carboniferous rocks at Marble Falls on the Colorado river, in Burnet county. Below these falls, in rocky crevices, are large lumps of coal, which have probably been brought down from strata up stream.

These falls are a succession of rapids over the up-tilted carboniferous strata, extending from the upper fall down stream about three-fourths of a mile to a bend in the river, where it turns southward among the mountains. The fall, in this distance, is twenty-six feet, as determined by Mr. Simpson of the survey. The carboniferous limestones here dip at an angle of about forty-five degrees, having been upheaved by the elevation of the neighboring granite, seen about one mile distant, and extending probably beneath the carboniferous rocks.

At the upper portion of the falls is a dark shale ten feet thick, having in its upper part numerous fucoidal plants, resembling somewhat the *Fucoides canda-galli* of Mr. Vanuxem, figured in his Geological Report of New York, and also again by Prof. Hall, who calls it *Sphirophyton canda-galli.* Lastly, similar plants are figured and described by Leo Lesquereux, under the generic name of Caulerpes. The greater portion of the Texas plants are much larger than those alluded to above, some of them being at least two feet in length, with stems extending but little above the base of the fronds, which were very delicate and beautiful, with curved outlines, sometimes to one side, and again drooping to both sides like the weeping willow. Here there were two and perhaps three species, stems being but rarely seen. Previous to finding these, I had seen the same things in the same shale formation of the carboniferous on Wallace creek, in San Saba county, where the plant stems are more distinctly seen.

The ferns and calamites of Young and other counties in the northern part of the State belong mostly to the upper coal measures, and the rocks further south in San Saba and Burnet counties are in the lower carboniferous, a portion of them probably belonging to the sub-carboniferous period.

JURASSIC.

About half a mile west and north-west of Phantom Hill, in the bluffs of the west side of the Clear Fork of the Brazos, I found what may be fossils of the Jurassic period, in hard limestones, so hard as to render it difficult to obtain well defined fossils. Intending to make a more careful study of these, I placed them in a box and shipped them to Austin, since which I have not seen them.

Eight or ten miles east of Phantom Hill, in the limestones on the bank of a ravine, I found undoubted carboniferous fossils, Productus Rogersii, Allorisma subcuneata, etc. Thus finding these has caused me to doubt whether the rocks west of Phantom Hill are truly Jurassic.

Southeast of Phantom Hill, in Callahan county, is some of the finest scenery in the State, on the head waters of Pecan bayou and Hubbard's creek. It is a prairie land of mountains and valleys, large springs, clear streams, and steep, rocky bluffs of mountains and valleys. On these hills, covered with grass made luxuriant by recent rains, we saw buffalo for the last time, six to eight being in a herd and all or nearly all old bulls. In Haskell county, we had seen herds of a thousand or more, bulls, cows and calves. Of these we had killed enough to keep well supplied with fresh meat. This Callahan county will ere long make good homes for many families. To return to the buffalo of Haskell and Jones counties, where they were feeding in September in large droves, General McKenzie and his soldiers had passed through Haskell county onwards toward the Double Mountain. Numerous buffaloes were dead along the route taken by the soldiers, many of which had probably been shot and ran away to die after the army had passed far onward. It is very easy to shoot and hit a buffalo, but difficult to hit him in a vital part, so as to cause him to drop and die. Such was our experience. At this season, the hides are of no value, not having any long hair excepting on the neck and shoulders; nor are the hides good until in December and January. Old buffaloes, especially the old bulls, delight to roll and wallow in the soft dirt. I have seen them roll and kick up their heels over and over, and then get up and shake themselves, apparently with great satisfaction. It will not be many years before Northwest Texas will be resorted to by crowds of Northern invalids, for the purpose of breathing its pure air, to behold its charming landscapes, and hunt and fish; hunt the buffalo, the antelope, the deer, wild turkeys, etc., and catch thousands of fish. Such pastimes will kindle the spark of life anew, and give new life to the body. With a climate like that of New Mexico, this portion of Texas offers superior advantages to those suffering from lung complaints. At present, there are no hotels and but few families living in the buffalo country.

DEVONIAN.

In 1860, when engaged with Dr. Shumard in the survey of San Saba county, some of the limestones and shales in the eastern part of that county, and the northwestern part of Burnet, were referred by him to the Devonian. The Trenton limestone was the formation recognized; its chief fossils found were of the following genera: Belerophon, very common, Maclurea, orthis, Murchisonia, pleurotomaria, and some other genera peculiar to that period. Since then I have not re-visited that portion of these counties, the whole of which needs a re-examination.

LOWER SILURIAN.

The calciferous sandrock, magnesian limestone, and Potsdam sandstone, all belonging to the Potsdam series of rocks; these are all well developed in Burnet, Llano, and the southeastern part of San Saba. The calciferous sand-rocks and magnesian limestones consist of siliceous and magnesian limestones, alternating in strata. In many places, large tabular blocks, two or more feet thick, of these limestones abound, suitable for first class building rocks, many of them being good marbles. They are white and dark gray, with intermediate shades. The upper strata are sometimes cherty, and in some few places they contain large crystals of rhomb spar, twelve to eighteen inches in diameter. They have but few fossils of the genera ophileta, holopea, orthocera and bathyrus. The surface of the country, wherever they form the uppermost layers, is very rough, with large and small masses of rock in great confusion, being of little or no value for agricultural purposes, except for pasturage. The cherty rocks are often filled with irregular holes, coated with drossy quartz, many of them having the iron rusty appearance of some of the gold-bearing quartz of California.

In Llano county, at and near the Packsaddle Mountain, the Potsdam strata lies unconformably upon the azoic rocks, in either horizontal strata, or in layers inclined at small angles. Near Honey creek, and also near the head waters of the Little Llano, it can be seen directly overlying the azoic metamorphic rocks. It consists of red, yellowish white and gray sandstones in strata, alternating often with gray limestones of different shades, some of which are nearly white. In Llano county, its fossils are more abundant than in either Burnet, Mason or San Saba counties. Its recognized characteristic fossils are of the following genera: Lingula, bathyrus, conocephalus, dicellocephalus, agnostus, arionellus, discena and others, many of which are undetermined. There is a fine exposure of these rocks at the Packsaddle Mountain, at the west end of which the following section was taken by the writer:

1.	Surface, dark gray limestone in thin layers.....	68	feet
2.	Reddish brown sandstone....................	46	“
3.	Hard, gray siliceous limestone, containing bathyrus, lingula and other fossils	55	“
4.	Light, blue grayish, compact limestone.........	172	“
5.	Soft, yellowish white sandstone................	32	“
6.	Similar to No. 3............................	12	“
7.	Reddish brown sandstone, with lingula and a few other fossils................................	326	“

8.	Granite, mostly covered with soil, sloping gradually into the valley	439 feet.

Numbers three and six are hard, compact, siliceous limestones, highly fossiliferous, tinged with green spots—silicate of lime. This section is interesting on account of the great similarity in lithological character, and the imbedded fossils of the two sections, numbers three and six, with two hundred and four feet of limestone intervening, which shows that a long period of time must have elapsed between the periods of their deposition.

The above section was made in the Spring of 1861. Last October I was there again, and in the bed of Honey creek, at the base of the mountain, is an uptilted shale, its strata being nearly upturned to the perpendicular, having evidently been thus displaced by the eruption of the granite. I shall allude to this shale again under the laurentian. Packsaddle Mountain is about 1600 feet high above the gulf, according to a measurement which I made with the barometer in 1861. It is the highest mountain in Llano county.

At but one locality have I seen the Potsdam dipping at a large angle. This is near the head waters of the Little Llano river, where the broken and upturned strata dip at an angle of about forty degrees west, ten degrees south, where I measured the following section:

1.	Hard, gray limestone	78 feet.
2.	Nodular gray limestone, in broken, disintegrating layers	3 “
3.	Hard, light gray limestone	14 “
4.	Shale, dark, friable, alternating with dark gray, compact seams, with traces of fossils	37 “
5.	Granite to the base, chiefly covered with rocky debris.	

No. 4 of this section has evidently been altered by heat. Its compact layers, of a foot or more in thickness, are cleavable into plates, an inch or less in thickness. On the faces of these plates are rarely faint traces of fossils, the chief of which is a dicellocephalus, mixed with nodular concretions, of from four to six inches in diameter, which are probably organisms altered by heat. Several specimens of the dicellocephalus were found in a state of perfection, sufficient to identify them.

This section is on the borders of the Potsdam, with the granites and metamorphic rocks southward of it, but here there has been an eruption of granites, long after the upheaval of the oldest granites of the azoic. This last upheaval has raised and altered by heat the older Potsdam rocks above. At the top of this are a few acres comparatively level, back of which are the high hills of San Saba county, rough with calciferous sandrock, alternating with magnesian limerock or marble, the whole often capped with rocks of a later age.

This is a very interesting locality, for we here have some chapters in the remote history of the earth, written by the Creator on tables of stone. They tell of the existence of delicately formed animals in tranquil seas, where they lived and died, and were buried in layers of sand which finally became indurated into solid rock. After this, in a shallow sea, a limestone was gradually formed from age to age, to the depth of about one hundred feet. Then came the eruption of the later granite, breaking, upheaving and heating the rocks above. Quiet again reigned, the granite became cool and solid, but the waves still rolled above, and other limestones began to form, in the slow process of which many, very many other ages passed; how long, none can tell, only that it must have been very long, because the limestones above our section are several hundred feet thick, extending back in nearly horizontal layers, containing shell and other marine exuvia, far into San Saba county.

At this place, horizontal beds of conglomerate, formed from the paleozoic rocks lie along, facing the cliffs. These conglomerates have been much worn away, and now stand in some places in long, tabular forms or rounded pillars. In the caves and crevices of the limestone cliffs of this neighborhood, nitrate of potash, or salpetre, is very abundant, sufficiently so to make it of economic value. See Saltpetre elsewhere.

Farther west, in the upper part of the Llano valley, some of the Potsdam sandstones are highly ferruginous, containing a large per cent. of iron. Nodules of iron are derived from those rocks, some of which have imbedded shells, which are also changed into iron, are of frequent occurence, scattered over the surface in the vicinity of these sandstones. At one place, near the military road, a few miles north of Fort Mason, there is a bed of iron in these rocks, nearly two hundred feet thick. These dark red sandstones are in massive layers of nearly horizontal strata, resting immediately upon the granite. In some places they contain lingüla in great abundance.

LAURENTIAN.

Beneath the Potsdam, which rests unconformably upon it, is a dark blue shale in strata, upraised at various angles, large and small; lithologically, it resembles some of the old slates of Vermont and New Hampshire, and also, of the mountains of North Carolina, in the granite regions of those States. No fossils have been found in these Texas shales. In the bed and banks of Honey creek, near the base of Packsaddle Mountain, it is an argillite, or roofing slate, with two cleavage directions. About four miles west of the town of Llano, in the bed of a stream, these two cleavages are well shown in the uptilted strata, extending from bank to bank, and the slate is changed into a light gray mica slate. All the gradations of such changes can be seen in Llano county, sometimes the slate being changed into a gneissoid rock, with the vertical cleavages distinctly placed. forming large slabs. Friable mica slates, containing garnets, sometimes underlie the granite. All the azoic metamorphic rocks are altered slates, which may, and, probably did, contain life, the traces of which have been effaced by heat and chemical changes. It is possible that some of the less altered slates may have fossils, for, as yet, but a cursory examination has been made of them.

AZOIC GRANITE AND OTHER CRYSTALLINE ROCKS.

These have already been incidentally noticed, which leaves but little to say respecting them. As already stated, their time of upheaval has been at different periods. Most, and probably all of the granites of the azoic region, are of a later period than the metamorphic rocks associated with them. The granite is occasionally traversed by veins of white quartz, associated with feldspar. Fine crystals of tourmaline, black, white and brown, are found on the sides and tops of some of the mountains in loose masses of quartz, and also in the granite. Amethystine quartz is in some of the mountains of Burnet county. Kyanite and other forms of asbestos are also in the granite region. Epidote both massive and crystalized is quite common; some of its massive, green forms have been mistaken by the inexperienced for copper ore. Garnets, large and small, are in some of the metamorphic rocks. In many of them, an impure gryphite abounds, as seen in the beds of many of the mountain streams. A porphyritic granite forms a large portion of the mountains in the northern part of Llano county, extending eastward from Baby Head Mountain to the copper veins near the head waters of the Little Llano river. Near these copper veins are hornblende slates in strata, uptilted like the other metamorphic rocks.

I have thus briefly described the principal geological formations of the State, which are known to the survey, not describing so much for the scientist, as for the practical men of the State who wish to gain a knowledge of its rocks, soils and minerals.

Specimens of those are in the State cabinet, where they can be seen and studied by every body who wishes to do so.

Some may be disappointed that I have not given a more favorable account of our mineral resources, especially of silver and lead, and perhaps, copper. I have seen no rich silver or lead mines in Llano county, although I searched diligently there during one week last October, guided by several of the most intelligent men of that county, men well acquainted with its known mineral resources. Exaggerated statements of mineral wealth do more harm than good to a State or country, because a reaction always comes sooner or later, when the truth becomes known. Texas, in reality, is rich enough in mineral wealth; there is no necessity of resorting to misrepresentation.

AGRICULTURAL REPORT.

The area of square miles in Texas is 274,356, an area larger than all New England, with New York, Pennsylvania, New Jersey, Delaware, Maryland and East and West Virginia added. Yes, Texas is larger than all these old States, which now have such a vast amount of people and wealth as to be more than sufficient to make a powerful empire. To bring the comparison nearer home, Texas is larger than the States of Georgia, Florida, Albama, Mississippi and Louisiana united, the entire area of all these old, rich cotton states lying upon the Gulf of Mexico being but 257,492 square miles.

It is only by making these comparisons that we can well comprehend the great extent of the State of Texas, and its capacity for supporting a large and wealthy population of many millions; for Texas is larger than France or Great Britain.

The truth of the matter is, Texas is so large and has such a variety of soil and climate, that people of all tastes, dispositions and degrees of intelligence can find suitable homes for themselves in some part of the State. Tastes differ; what pleases one will often displease another; and what will satisfy one, will disgust another. It is well it is so, because it scatters the people broadly over the land. Some people with roving natures are never suited with any country. I have seen some who have been with their families from Texas to California, with wagons on the overland route, and back to Texas, and again to California, and again back to Texas. One family had been back and forth three times, and was then in an unsettled condition.

CLIMATE.

Texas has a varied climate—from moderately temperate to semi-tropical. In the northern part snow and ice, and some extreme cold days come in the winter, but the cold is not constant, and the larger portion of the time the weather is warm and pleasant; hence, but little fodder and shelter is needed for stock.

In the Central portion, snow and ice are seldom seen, and in the extreme south, at Brownsville, rarely, if ever.

Climate has a marked and great influence over our health and happiness. Warm, pleasant days give life and cheerfulness; cold. stormy, rainy days, gloom and discontent, as is proved by the number of suicides being greater in Paris, London, and other large cities, during cold rains and storms.

In the Northern and Middle States the most common topic of conversation is the weather. When friends or acquaintances meet, the first thing generally spoken of is the weather. Then, during from four to eight months of the year, a warm, pleasant day is of such rare occurrence as to be hailed with joy.

Not so in Texas; pleasant days are here so common that they fail to excite the attention, being expected as a matter of course; hence the weather is here rarely spoken of,

A friend of mine, a graduate of West Point, had weak lungs and also a bronchial affection, to cure which he had arranged to go to the south of Europe with his family, having partly packed his trunks for the journey, when his eye fell upon a publication of mine in "The Country Gentleman,'' about the climate of Texas at Austin and westward. He immediately wrote to me, and the result was, he came to Texas with his family, and spent the winter at San Antonio and Austin.

When here, he told me there had been scarce a day in which he could not ride out with pleasure and comfort, adding that if northern people only knew what a land and climate were here, they would come to Texas in crowds.

He made another remark which, although foreign to the subject, I will relate because the people of Texas have been shamefully slandered and misrepresented. Says he, "I have now been three months in Texas, and during that time I have seen less drunkenness, less fighting, quarreling, etc., than for many years I have seen each and every week in Detroit, Michigan;" and Detroit is not worse than other northern cities. This speaks well for San Antonio and Austin. His name was George Rose. He gained in flesh twenty-five pounds while here. Said he should return to live in Texas, and he was able to live in any place, for he had an income of ten thousand dollars a year. He returned to the north and died.

The rain fall at Austin averages a little more than thirty inches annually. At Fort Belknap, in Young county, it is about twenty-two inches, which is nearly the same as that reported for Kansas. In Eastern and Southern Texas it is probably about 40 inches, and in the southern part of the State 50 inches or more.

Much has been said and written of the influence of trees upon the rainfall. From experiments which have been made in France during a number of years, it is stated that where the experiments were conducted, trees gave an increase of twenty per cent. of rain. Without doubt the leaves of growing crops, cotton, corn, etc., have more or less effect upon the moisture of the atmosphere, and consequently upon the rainfall. Also, some trees drink in and send out more moisture than others. The post oak is a dry growing tree; it imbibes little and gives out but little water. Cotton wood, pecan, water oak, etc., are examples of large drinkers. That growing crops increase the rainfall is proved by the greater amount of rain realized in Kansas and other States where a largely increased area has been cultivated.

I have seen many persons during the summer who expressed a desire that the Legislature would pass a law to encourage tree-planting on the prairies. This has been done in most or all the prairie States, and Texas should not be behind her sisters in the march of improvement. Others want something done to punish those who set on fire the dry prairie grass, whose flames sweep along and kill trees, burn fences, stacks of grain and hay, and even houses, of which we saw a few instances.

A late writer has given a list of the States which are the most and least subject to give pulmonary or lung diseases, consumption, etc. Among the most healthy as regards these diseases, is New Mexico ; Texas ranks but little less in the scale of health, and if we only take into account the western and northwestern portions of the State, these places will be found equally as healthy as New Mexico. It is well known that consumptives the best regain health in countries having a dry, pure atmosphere. Next beneficial are associations calculated to cheer and please them when riding or walking abroad. To do this, western Texas has fine scenery and roads over most of which horses can trot both summer and winter. The climate of Eastern and Southeastern Texas is too moist for the improvement of people having lung complaints, as is also the southern part of the State.

Appended is a report of the temperature and also rainfall at Austin for the past eighteen years, as kept by Professor Van Nostrand, Principal of the State Deaf and Dumb Asylum.

Monthly and Annual Mean Temperature, in degrees and hundredths.

	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.
Jan'y...	54.22	49 13	50.00	49.89	57.20	53.99	46.18	44.98	53.29	51.06	46.17	50 99	51.23	50 29	43 76	46.17	52 51
Febr'y..	50.61	59.96	53 59	55.09	51.49	56.64	55 19	53.82	50.24	58.44	52.63	52.39	55.40	57.10	53.00	56 38	53 89
March.	61 60	62 05	60.93	63.05	63 21	62.73	57.75	59.37	63.00	51 52	64.69	59.90	59.45	63.06	57.89	62.98	63.44
April....	69 19	67.10	70.41	69.21	66.74	69.71	66 34	66.46	67.56	67.90	68.23	65.09	67.57	68.94	70 43	65.86	63 16
May.....	74.68	73 47	78.24	73 91	74.04	74.85	74.52	75.63	73.93	73.93	75 29	72.69	75 15	74.33	75.22	75.04	75.16
June...	79.14	83.64	86.16	82 78	82.60	82.64	78.72	80.58	81.26	81.24	82 47	78.96	78.83	83.05	80.59	80.17	81.76
July.....	84.87	84.90	89.70	84.93	87.22	83.32	83 23	83.97	81.34	83.59	82.22	80.54	82.18	86.87	83.50	82 33	83 28
August.	84.87	86.26	82.86	83.56	86.13	84.53	84.32	85 10	80.62	82.62	81.71	83.18	81.35	86.05	84.28	82.06	86 50
Sept'b'r	77.42	77.02	77 56	77.57	79.81	76.36	81.72	82 19	75.42	78.42	77.41	74.92	78.32	76.94	80 88	77 66	76.51
October	71 81	65.17	68.85	64 29	66.56	60.90	64.61	66.92	69.21	71.59	68.95	62.09	68.23	66.04	68.85	65.75	68 90
Nov'b'r	51.79	62 37	55 54	64.28	57.80	57.41	56.23	58.14	62.26	59.39	55.72	62.48	60.13	51.87	53 31	58 63	....
Dec'b'r	51 27	42.07	50.32	57.83	54.22	50.72	51.93	48.01	51 82	61.20	48.37	46.61	45.89	49.94	45.22	54.96	....
Annual Mean	67.61	67.76	68.68	68.87	68 92	67.82	66.73	67.10	67.49	68.41	66.99	65.82	66.98	68.12	66.40	67.33	....

Amount of Rain, in inches and hundredths.

	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.
Jan'y...	2.95	2.13	2.53	2.75	.19	6.30	.17	3.12	.38	.00	.36	5.06	.64	2.28	2.33	1.02	1.23
Feb'ry..	.96	1.08	4.43	1.23	1.63	6.92	3.36	6.00	1.18	.72	3.48	.61	.58	1.41	1.45	.80	1.50
March..	7.02	1.75	.66	.61	1.24	.85	2.43	6.51	3.43	1.48	4.55	3.51	2.29	2.13	2.82	3.01	5.94
April...	.49	.56	2.05	1.95	4.12	1.96	3.03	2.42	6.07	1.45	3.63	3.09	2.74	1.30	2.55	1.78	1.43
May.....	8.80	2.45	.13	7.89	4.63	2.51	.99	.17	5.46	1.30	2.33	3.85	6.98	4.93	3.87	4.59	1.16
June....	1.07	1.94	.77	1.19	.62	2.92	5.16	5.29	2.15	5.05	.69	2.34	2.60	.55	6.90	9.06	1.68
July.....	3.80	1.73	.14	.07	.72	2.37	.67	.23	4.34	.65	2.55	9.20	2.04	.00	1.91	4.33	5.12
August.	.44	1.39	10.88	6.12	4.32	1.29	.98	.08	7.51	3.27	7.00	1.14	4.27	2.14	1.59	3.32	.94
Sept'b'r	5.01	10.41	1.28	2.35	2.07	7.02	1.34	8.62	4.84	6.41	1.72	4.16	1.67	2.61	0.00	11.02	13.84
October	2.90	4.45	.45	3.53	3.01	1.04	2.75	3.52	.38	2.08	4.65	2.72	12.63	7.22	1.59	2.37	.32
Nov'b'r	.75	.54	5.85	.00	.35	.10	2.41	1.49	4.81	2.98	4.17	1.54	3.49	4.14	1.74	2.93	......
Dec'b'r.	2.18	1.81	.44	1.00	.87	.57	1.87	.95	1.40	1.80	4.96	1.32	1.30	.50	3.06	.71	......
Annual Amount	36.37	30.24	29.61	28.69	23.17	33.85	25.16	38.40	41.95	27.19	40.09	38.54	41.23	29.21	29.81	44.94	......

Table of Maxima and Minima Temperatures—1858 to 1874.

MONTHS.	1858.		1859.		1860.		1861.		1862.		1863.		1864.		1865.		1866.	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
January	72	33	74	22	76	18	79	23	86	23	78	28	79	6	73	20	78	21
February	83	26	79	32	80	24	78	27	88	25	78	30	80	23	80	32	84	19
March	79	27	93	36	85	37	86	39	97	28	85	43	84	32	80	26	83	44
April	91	48	93	46	92	51	90	52	87	46	90	45	89	47	83	51	89	41
May	91	55	95	61	101	60	89	57	91	60	99	60	96	58	103	51	93	57
June	91	64	101	73	102	76	96	73	103	71	98	69	96	67	96	69	95	62
July	96	62	99	74	107	77	99	76	104	74	99	69	99	71	95	75	96	71
August	98	70	101	72	100	73	100	71	103	74	99	68	99	71	106	75	96	68
September	97	61	98	60	94	59	94	54	97	63	97	59	98	66	98	70	91	55
October	90	51	87	40	93	42	91	40	96	31	86	30	88	43	90	42	87	47
November	75	27	83	24	83	24	85	34	84	33	85	20	80	25	83	36	83	36
December	71	22	77	10	80	25	81	32	75	30	76	17	87	19	82	18	78	30
Means	86	46	90	45	91	47	89	48	92	46	89	45	89	44	89	47	88	46

MONTHS.	1867.		1868.		1869.		1870.		1871.		1872		1873.		1874.	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
January	78	17	87	15	73	27	76	29	76	24	69	19	73	13	77	28
February	84	25	83	26	83	28	85	27	80	31	79	27	80	30	78	31
March	85	21	83	40	88	29	83	29	83	43	80	32	88	30	84	45
April	92	46	89	50	90	45	88	42	87	45	89	50	91	40	84	40
May	92	58	90	59	88	57	94	63	89	57	90	59	94	56	94	57
June	97	66	95	68	90	69	91	64	100	72	94	68	96	67	96	72
July	97	71	96	72	93	71	95	71	100	77	96	74	96	72	102	71
August	98	72	96	71	97	75	96	72	102	72	99	72	96	72	104	74
September	94	65	94	58	95	54	94	65	94	54	98	61	95	63	96	59
October	96	45	93	45	86	40	86	47	87	45	92	40	94	34	85	46
November	83	28	83	34	82	36	90	30	82	30	85	27	83	33	.....	...
December	86	28	74	21	72	19	74	11	78	22	76	15	83	27	....	..
Means	90	45	88	46	86	46	85	48	88	48	84	45	88	44	.....	...

SOILS OF THE TERTIARY.

About three-fourths of the area of the counties east of the Trinity river, is composed of sand clay soils, and the remainder includes the dark alluvious of the valleys of rivers and streams, with a small proportion of dark prairie land.

CLAY SOILS

embrace by far the largest area of this country. They contain from fifty to seventy per cent. of sand or silica, and the remainder twenty-five to forty-five per cent. of clay or alumina, with a small proportion of lime and oxide of iron. The average fertile soils of the country have sixty or seventy per cent. of silica; the larger proportion of sand, being the best soil, and most easily tilled. It also withstands the drouth best, and permits the roots to go freely through it. Such a soil, with a clay subsoil, can be easily improved by fertilizers, rotation of crops, and judicious cultivation. We were often told, when in Central and Eastern Texas last summer, of lands which had been annually tilled, twenty years or more, without manure, which still bore as large crops as when first cultivated. Such soils, properly managed, may have their fertility constantly increased.

The red clay soils are colored by the red oxide of iron, which renders them more fertile. Such soils are common throughout the tertiary region, often being noted for their fertility. In some places the proportion of clay is greater than given above; such becoming plastic when wet, forming good brick, but the proportion of clay is too great to render the soil desirable for cultivation.

SANDY SOILS

are those which have from eighty to ninety per cent. of sand, and only ten to fifteen per cent. of clay, lime and a trace of iron. If such soils have a clay subsoil, and a good tillage with a moderate use of fertilizers, they yield good crops. This has been proved in the piney woods region of the Gulf of Mexico States. Lands there, which a few years ago were thought to be nearly worthless, properly tilled and manured, yield good crops of corn, cotton and sweet potatoes. Many other vegetables also grow remarkably well in such lands; hence, the piney woods lands of Eastern and Southeastern Texas will not be worthless after the timber is cut off, as many imagine.

DARK PRAIRIE AND ALLUVIAL SOILS.

vary much in their composition. They owe their dark color to humus and vegetable matter, containing a greater or less proportion of carbon, derived mostly from decaying vegetable matter. When sand enters largely into their composition, they form sandy loam, which contains from sixty to ninety per cent. of sand. The better soil is, when the proportion of sand is about seventy-five per cent., fifteen to twenty per cent. of clay, and the remainder lime, humus and oxide of iron. Such soils prevail in the prairie region of the tertiary of Central and Eastern Texas.

SOILS OF THE CRETACEOUS.

These belong mostly to those last named, containing, however, a larger proportion of lime derived from the prevailing rocks of the country. When the proportion of clay and lime is large, it forms a tenacious soil hard to till, and, in wet places, it often has hogwallows. Such soils yield well, forming some of the most fertile soils of the State. Yet most persons prefer soils having more sand, and less clay and lime.

The cretaceous also has on its prairies sandy soils, well proportioned and of remarkable fertility. Such soils prevail in Bell, McLennan, Falls, Navarro, and all the cretaceous counties northward to the Red river.

In some few instances, the proportion of lime is too great, the limerocks too near the surface. Then the plants cannot there stand the drouths and heats of summer, and they wither and die. Such lands can be rendered fertile by a large application of clay and sand.

The carboniferous soils embrace all the foregoing; nearly every county in this formation has every variety of soil, and of greater or less fertility. The carboniferous is embraced in the stock region, where little attention, comparatively, has been paid to the raising of grain, until quite recently, because it was generally supposed that the climate was too dry for the successful growth of corn. But the experience of the last few years proves that, when the ground is plowed deep, planted early, and tilled well, average crops of corn are the result; hence, now people are turning their attention much more than formerly to the raising of corn, and the growth of small grain.

AZOIC SOILS.

Granites and their associated igneous rocks are mostly composed of silica; hence, their disintegration gives rise to sandy soils, which prevail throughout the azoic region. The older limestones are also there, or in the neighborhood, which tend to add a due proportion of lime to the soil. The feldspar of the granite also contains alumina and potash or soda; hence, the soils of this region have a greater fertility than their appearance indicates.

We often read of loamy soils, clay loams and sandy loams. A sandy loam has from sixty to ninety per cent. of sand; a loamy soil, thirty to sixty per cent. of sand. A clay loam has a large proportion of clay, and only fifteen to twenty per cent. of sand. All these proportions vary constantly, often in the same field, within a few feet of each other, and they are all found to a greater or less extent in Texas, being included in the preceding account of the soils of the principal geological formations.

ANALYSIS OF SOILS.

I have not as much faith in the practical value of having soils analyzed in the laboratory of the chemist, as some. Soils, distant but a few feet, may vary in their composition, or, some of the fertilizing matters in it may be in such small quantities, as to escape the notice of the chemist. But it is very important that the agriculturist shall know the nature of the soil which he tills, at least, its principal ingredients. I append a few directions, which will enable him to do this. To find the amount of sand and clay in soils, and also the moisture:

Weigh the soil and spread it on clean paper, and put it in an oven, not heated enough to discolor the paper. When dry, weigh again, and the loss in weight gives the amount of moisture.

Weigh another portion, put it in water and stir it until it is thoroughly incorporated with the water; boil it, so as to entirely divide the particles; then let it settle. The sand will first fall to the bottom, and as soon as the clay begins to settle pour off the water; dry and weigh the sand, and you have the amount of sand, which subtract from the entire weight, gives the amount of clay.

To obtain the amount of lime in a soil, mix 100 grains of the dry soil with half a pint of water, and add half a wine-glass ful of muriatic acid; stir it thoroughly several times during the day, and let it stand and settle over night. Pour off the clear liquid in the morning, and again fill the vessel with water and stir thoroughly, and when clear again, pour it off; dry the soil and weigh it. The loss of weight is the lime it contained. An easy method of testing a soil to see whether it has much or little lime, is to pour on it a few drops of strong acid, sulphuric or muriatic. If much lime be present, there will be an active fermentation, if less lime, less fermentation, and no lime, no fermentation.

The organic matter, or vegetable mould in a soil can be ascertained by drying the soil well in an oven; then weigh it; then heat it to dull redness, over a lamp or bright fire, until the combustible matter is burned away and evaporated; then weigh, and the loss is the amount of organic matter. This organic matter contributes largely to the fertility of a soil.

In traveling last summer in Eastern Texas, I was astonished to see such large growing crops on its sandy lands, which, a few years ago, I thought to be of little value. But the experience of the few last years teaches that the upland sandy soils, with a comparatively small percentage of clay, are the best for a varied cultivation, for fruits, small grains, etc., besides they yield good crops of corn and cotton.

Last year, (1873), many of the owners of small farms in the uplands of Robertson and other counties, made more profits than some of the owners of large plantations on the Brazos; the latter sometimes not having money enough from the sales of their crops, to pay the expenses of raising them.

Soils may have the same chemical composition, yet vary in their degrees of fertility. The less fertile has large grains of sand, etc., and the most fertile has all its ingredients ground fine so as to be imbibed easily by the rootlets of the growing plants; hence the great fertility of the deltas of rivers, the Nile, the Mississippi, and the alluvial soils of our own rivers near the Gulf, depositions made from the finest particles, the coarser having been left far up stream. The soils of the Red River bottom in Northern Texas are of a similar character, depositions of the Red River and its tributaries from the far off up country. Much of the fertility of these soils is also owing to particles of gypsum finely ground, also brought down from that up country.

When I was a student, I one day found large piles of light gray and slate-colored rock, with some clear izinglass-like crystals, on the wharves. One of my studies was mineralogy, and I soon found the crystals were selenite or crystalized gypsum, and that all the rocks were gypsum from Novia Scotia, from whence they had been brought by a schooner to Middleton, Connecticut, to be ground and applied as a fertilizer to the growing crops. By the application of this and other fertilizers, a large proportion of the soils of New England have had their fertility increased, although cultivated for hundreds of years, and are now rated at from $50 to $300 per acre—soils no better by nature than some abandoned fields I saw last summer in some of the oldest settled counties of Texas.

When more railroads are made, and some of them go into the gypsum region of Northern Texas, and bring down car loads of it, to be ground and fed to the crops of corn, clover, etc., of Central and Eastern Texas, then there will be no more worn out lands, but instead an increased fertility to the soil, increased value to the land, larger yields of crops, and more money for the farmer.

RED CLOVER.

A Mr. Townsend, of Calvert, told me that he had some clover growing in his garden, the stems of which were nearly five feet long. Now, if clover will grow in the garden, it will grow in the field, and fields of it have been grown in Texas, especially in its more northern portion. I know from experience that the application of plaster of paris, or gypsum, to clover, at the rate of about one and a half bushels to the acre, increases the growth of the clover more than one-half. Land, which would not grow clover without gypsum, gave large yields of clover with gypsum. These were sandy soils. Gypsum has the power of fixing the ammonia in the soil, and of retaining its moisture, thereby enabling the plant to stand the drouths of summer.

California clover of some, medicago satina or lucern (which is a native of Europe and highly valued there as a forage plant), also does well in Central and Eastern Texas. In the woods of the Brazos bottom, at the International Railroad bridge, near Hearne, I saw a very luxuriant growth of this plant, stems three to four feet long; so long that they had not been able to maintain an erect position.

ALSACE.

This plant has been sparingly cultivated as a forage plant in some portions of the State. I saw specimens of it growing in the garden of Dr. Hunter, at Palestine, in Eastern Texas.

TEXAS GRASSES.

Texas has more native grasses, probably, than any other State in the Union, North or South. About two hundred species of native and foreign grasses have been noticed by the writer. Many of these are excellent for pasturage, and some few for hay. Of what are called the mesquite grasses, there are several species, all of which are good for stock. One of these mesquite grasses is called buffalo grass, on the western plains towards the Rocky Mountains; hence its botanical name of Buchloa. It is diœcious, having its barren and fertile flowers on different plants. The barren stems are four to eight inches high, erect and conspicuous. They also have stolons trailing on the ground. The fertile plants also have stolons, and the seed is placed in the angles or tops of the stem near the ground. Fertile plants are not common, the grass being mostly increased by stolons. It endures the most severe drouths, its apparently dead, dried up plants being revived by rains. It forms beautiful lawns. After the rains of last September, the prairie hills and valleys, with their clumps and solitary trees of live oak, in the counties of Callahan, Coleman, Brown, San Saba and Lampasas, presented some of the finest lawns and landscapes I have ever seen. It is a delightful region, abounding in fine scenery.

The Colorado grass of Travis county grows to the height of from four to five feet, in thick clumps or tufts, like wheat, yielding sometimes, and indeed quite often, more than two tons to the acre. It is remarkably succulent and tender, making a superior hay, preferred by many horses and cattle to corn fodder. It is an annual and very fast grower, ofter springing up in cornfields after the crop is laid by, and maturing in August. The farmers of the Colorado valley, near Austin, often get a crop of corn and one of hay from the same land in one season. Its botanical name is panicum (Erichloa) Texanum, having first been described by the writer in his preliminary report of the geological survey in 1866.

There is another native grass, which also grows in the old States east of the Mississippi. It has been grown for hay by Col. J. T. Brady, of Houston, and others. It also grows to the height of from three to four feet in low rich soils, giving two or more tons to the acre of very good hay. It grows rapidly; starting in autumn, it matures in this climate in April and early in May. It took the first premium for hay at the Houston State Fair in 1873.

Dr. Lincecum has tested and cultivated on his farm, at Long Point, in Washington county, about fifty species of native grasses, specimens of which he has presented to the State collection, accompanying which was the following letter:

"From No. 1 to 17 is a duplicate suit of grasses indigenous to Texas, which I contributed to the State cabinet several years ago. I understand, by letter from Prof. S. B. Buckley, that my first set of grass specimens have all been destroyed.

"Herewith I contribute to the State cabinet a new suit, with twenty-nine additional species of Texas grasses. These are all good, nutritious grasses, very suitable for a mixed grazing pasture for both winter and summer use. Quite a number of them are very fine spring grasses, which, with a little attention, flourish finely, and are sightly and most excellent for hay. The common broom straw, curly sedge and some other prairie species, are not included in this collection. Should it be necessary, I can obtain them from my meadow next summer. This meadow is stocked with all the original Texas grasses, and in the months of April, May and June, it is a good place to visit, to renew the recollection of how Texas prairies looked thirty years ago. In it are to be found all kinds of the rich, luscious, wavy grasses, and highly painted, nodding flowers that fed the flocks of deer, antelope, and vast herds of buffalo, and freighted the balmy south wind with sweet fragrance ten thousand years previous to the time the polluted tramp of unholy civilization had defiled these once beautiful plains. The meadow contains thirty-five acres, and to those whose tastes lead them to examine unadulterated nature, it is a pleasant place, when it is blooming and casting its fragrant odors upon the air for a mental feast.

"Any one who will take the pains to enclose a plat of outlands, and to keep the stock from it three years, will find himself the owner of a similar meadow.

"GIDEON LINCECUM."

I could say much more of the Texas grasses, but time and space will not permit. It is to be hoped that the Legislature will make provision for a State Botanist, that we may have a correct report of the trees, grasses and plants of the State.

TREES.

There are from fourteen to sixteen species of oak in the State, some of which attain great size. One, which is called the Spanish oak, in some of the Southern States east of the Mississippi, and in others, red oak, and grows in Central and Eastern Texas, rarely extends west of the Brazos river. One of these I measured in the Brazos bottom, in the eastern part of Washington county, and found it to be more than seventeen feet in circumference, at three feet from the ground, and upwards of one hundred feet high, with a nearly uniform diameter for a about thirty feet upward. Its botanical name is Quercus Falcata. The bastard white oak (Quercus Durandii) is one of the toughest and most valuable oaks for timber known. It grows in the bottom lands of Little river, and also on the Colorado and Brazos rivers, south of Austin. It is used for making wagon wheels, and other purposes where toughness and durability are required.

We have three species of elm, three of maple, five of hickory including the pecan, two mulberries, two species of persimmon, one sycamore or button wood, three species of magnolia, two of hackberry, several willows, four species of pine, one cypress, etc., etc.

PINE.

Texas abounds in pine timber, having one of the finest pineries in the world. Most of the pine lands, indeed, nearly all which are known to the survey, are in the tertiary region. The pines extend, with occasional interruptions, from Red River county, through eastern Texas, to the Sabine. In the counties north of Nacogdoches, there are but two species—the short-leafed pine, (pinus mitis,) and the old-field or loblolly pine, (pinus tæda). The first is the most abundant, being in the ratio of nearly three to one. It grows very tall, as high as 130 feet, with a diameter of from two to three feet. The old-field pine grows larger, having sometimes a diameter of five or more feet. The largest I have seen in Texas, had a diameter of about four feet at three feet from the ground.

Both of these pines make valuable lumber, and are used extensively for building purposes, giving a large freight business to railroads going from the eastern to the western parts of the State.

In Nacogdoches county, the long-leafed pine (pinus palustris) has its northern limit in the State, from which it extends southward to the Gulf. It is also accompanied by the two former pines; but, from a few miles south of Nacogdoches, the long-leafed is the principal pine. It has a diameter of from two to four feet, rarely being more than three feet. Nearly all of the counties south of Nacogdoches, between the Trinity and Sabine rivers, abound in these pines, forming one of the largest and most valuable pineries in the world, because the long-leafed pine is the very best one known for lumber, being very resinous, hard and durable. I have seen it used for furniture and for the inside work of houses, where it makes a rich appearance when varnished. It is the principal pine used for turpentine, rosin, etc., in North Carolina, Florida, and elsewhere. This was formerly a very profitable business, and it may be still, and probably is. One thing is certain, the pine lands of southeastern Texas have not been valued high enough, nor will they be until railroads penetrate that region.

CYPRESS.

The swamps of that section also have some magnificent cypress trees, (tax odium distichum). In the summer of 1861, I saw a large raft of cypress timber at Orange, whose logs were sixty feet long, and none of them had a diameter of less than four feet at the top.

Several of the counties west of Austin have very large cypress trees on the banks of streams. In 1861, I measured some on Cypress creek, in Hays county, which were of the following dimensions at three feet from the ground: one nineteen feet six inches in circumference, another twenty-four feet three inches; one twenty feet four inches, and one twenty-seven feet four inches, the last being a little more than nine feet in diameter at three feet from the ground. None of these trees had the enlarged conical bases which are so prevalent in the cypress swamps of the South, but all had a nearly uniform diameter upward to the height of twenty feet or more. A cypress stump near New Braunfels, measured by Mr. Lindheimer, of that place, was seven feet in diameter at top, in 1860.

Cypress lumber is very durable. A few years ago, (1858), a house at St. John's Berkley, near the Santee river, in South Carolina, which was built in 1712, had, at the time of my visit, its verandah and its railings in a good state of preservation. This is a remarkable durability, because it was constantly exposed to the weather.

CEDAR.

There are two species of cedar in Texas—the common red cedar, (juniperus Virginiana), and the mountain cedar, common on the hills north of Austin. This last is much used for fencing purposes, for posts and rails, and also for railroad ties. The timber of both these species is very durable.

In no other country have I seen such tall cedars as in Texas. Many years ago, on a Potomac steamer, below Washington, I met with a gentleman from Texas, who said that red cedar grew there more than one hundred feet high; (at the North their greatest height is only about thirty feet); that such cedars were sawed into lumber and used for building purposes, and also split into rails, etc. Not long afterward, I met Dr. Torrey, the botanist, in New York, and told him about the Texas cedars. He said the story was very improbable, and that he did not believe it. But such cedars really grow in Texas. I have seen them and measured them. I have seen seven rails cut from one, rails not less than ten feet, and some of them twelve feet long, the tree being a little more that one hundred feet long as it lay on the ground, the logs not having been removed. This was on Richland creek, in Navarro county, in 1860, where such trees were not uncommon. Capt. Love, who was causing the rails to be made, told me that he had seen cedar trees one hundred and twenty feet long. I measured one tree there which was nine feet ten inches in circumference at three feet from the ground. This was about one hundred feet high. I also measured the cedar sills of a bridge over Richland creek, which were fifty-two feet long, and were fourteen in diameter at base, and ten inches at the top end. The shingles covering the courthouse of that county, (and it was a fine looking building,) were made from one single cedar tree. This tree had four and a half feet diameter at stump height.

Since then, and during the present season, I have seen some tall cedars in Central and Eastern Texas. Some of these were in the Red River bottom, in Lamar county, north of Paris. These big, tall cedars are too valuable for lumber and for fencing to be permitted to live, and it is to be feared that in a few years more, few, if any, of them will be left.

LIVE OAK.

The live oak grows taller in Texas than elsewhere. In the old cotton States, it is a low spreading tree. On the Brazos, below Richmond, in southern Texas, I measured several trees in 1861. One had a circumference of nineteen feet and ten inches at three feet from the ground, and another was eighteen feet and nine inches, at the same height. This is not an uncommon diameter for the live oak—the wonder is, the tallness of their trunks, they being long stemmed, without limbs, to the height of thirty and forty feet, and some even fifty feet, with tops not remarkable for extent of limbs. The live oaks extend northward through Central and Western Texas to the Red River.

SWEET GUM—(*Liquid Amber.*)

Is quite common in Central and Eastern Texas, being there often a large, tall tree, with a trunk 3 to 4 feet in diameter.

PECAN.

This tree frequently attains great size in the valleys of rivers and streams, having sometimes a diameter of from 4 to 5 feet. It has a wide range, extending northward to the Red River, and northwestward as far as we have been.

ASH.

Many species are common in the State. In the Brazos and Trinity river bottoms some of these trees attain great size—three or four feet in diameter. In the northern States the wood of these trees is prized for the wood work of wagons and carriages, and also for the manufacture of agricultural implements.

For the making of all these things, Texas has an abundance of the best of timber, especially in its central and eastern portions.

GRAPES.

There are seven species of grapes indigenous to the State. "Vitis Æstivalis," or summer grape, which, however, at the north does not ripen its fruit until September and October.

"Vitis Vulpina," or muscadine, which is also often called the bullace grape. This grows from the southern part of the State, northward through Central and Eastern Texas, to the Red River. It is the parent of the scuppernong, which will probably do well throughout most of that region.

"Vitis Lincecumi," or post oak grape, which grows throughout the post oak region of the tertiary. For a further account of this grape, see Appendix. I will, however, add that Dr. Gray referred this grape to V. Labrusca, and recently Dr. Engelman, of St. Louis, calls it V. Æstivalis. Both are wrong, and every one acquainted with it in Texas knows it to be a very distinct grape. Dr. Morrow, of Robertson county, who is a very good botanist, told me last summer that he knew of but three growing vines of the Æstivalis in that county. He had known it well in Tennessee. Both it and the post oak grape grow on his place in Robertson county, and he knew them to be very distinct in fruit and habit. The Æstivalis climbs the highest, has the largest racemes, the smallest fruit, and ripens about one month the latest. It also has the smallest leaves.

Of the post oak, there are already two or three esteemed varieties in cultivation. One of these is called McKee's ever-bearing grape, because it is said to have ripe fruit during several months of the summer time. It is said to be an excellent table grape, good for wine and probably also to make raisins, it being of good size. It is cultivated by Dr. Yoakum, of Larissa, Cherokee county, and by him considered to be a great acquisition.

At the place of Mr. Wilkins, in the north part of Lamar county, last summer, I saw a post oak vine which the family said bore one of the best grapes, if not the very best, they had ever seen, and they had a large variety of grapes in cultivation. Mrs. Wilkins gave me some post oak grape wine which was very excellent, the grape being considered the best for wine of any they had in cultivation. Dr. Yoakum considered the McKee ever-bearing, the scuppernong, and the Concord to be the three best grapes for cultivation at his place in the northern part of Cherokee county.

The mustang grape, (Vitis Mustangensis,) is the most widely diffused of any grape in the State. I met with some few persons during the summer who called it the post oak grape. It grows throughout most of the State, and attains a large size, sometimes almost completely overspreading the largest trees. It is readily known by its leaves, which are of a deep green above, and tomentose white beneath. Its fruit has also very distinctive characters, being large and black, nearly an inch in diameter, in clusters of moderate size. It is little esteemed for eating, on account of an acid juice in the inner cuticle of the skin, which, if swallowed, gives a burning pain in the throat. I have found some varieties quite palatable, and there is no doubt but that some good grapes for cultivation will be derived from the mustang. I have one which bears a large white grape, which promises to be good for wine.

The mountain grape, (Vitis Monticola,) grows on the sides and tops of the mountains in Burnet and San Saba counties. It climbs to a moderate height, has comparatively small leaves, of a pale green, somewhat corrugated above when young, tomentose beneath, slightly lobed. Its racemes are quite long and fruit somewhat scattered, varying in color from pale yellow to deep black, of medium size, about half an inch in diameter, juicy with a pleasant acidity ; ripens September. Such are some I have in cultivation. It is said that some of its forms in the mountains ripen as early as the first of August.

The three last grapes were first named and described by the author in 1861, in the Proceedings of the Academy of Nat. Sciences at Philadelphia. (See Appendix.)

Nitis Nepestris grows in the valleys of Western Texas, sometimes climbing to a moderate height, and again growing erect in thick patches along streams, without climbing.

Its leaves are of a light green, very smooth, largely and sharply serrated, slightly lobed, resembling somewhat the muscadine leaves. Its fruit is small, on racemes two to three inches long, closely placed, not very juicy or good, as cultivated by me. I have heard of some of its fruit being very good among the mountains of the northwest.

Vitis Cordifolia, or the winter grape, is common in valleys throughout a large portion of the State. I have never seen any of its fruit which was good for eating or wine, its grapes having very little juice.

Vitis Vulpina, muscadine, or bullace grape, grows throughout a large portion of Central and Eastern Texas, as far north as Red River. It grows along streams, being rarely seen on uplands north of the latitude of Washington county.

It is the parent of the scuppernong, which is so highly prized in the old cotton States. It is probable that it will do well in most of Central and Eastern Texas.

A large portion of the State is well suited for grape culture. In Central and Eastern Texas I saw some fine vineyards. Several of these are in Robertson county, at Calvert and Bremond. When I was there, the last of May and first of June, the vines were loaded with fruit, and had a vigorous, healthy appearance. I was told that the grapes were not subject to mildew, owing to the droughts and breezes of summer. Most of the cultivated kinds do well, or rather best, on sandy soils with a clay subsoil. Hill sides and lands not adapted to ordinary tillage, seem best suited to many kinds of grape, which require a dry soil of moderate fertility. Indeed most grapes do best in dry upland lands, which do not retain moisture for a long time. Valleys often have such soils, while some of the adjacent hills have tenacious clays, where the water stays for weeks and months. I knew of a man in Texas who planted a vineyard on just such a hill. Of course his grape business was nearly a failure. There are few, if any, fruits which will endure droughts so well as the grape, for the cultivation of which a very large portion of Texas is peculiarly well suited. In Texas there are many hill sides and uplands which can now be bought for fifty cents an acre—lands better than some I have known to be sold in Western New York for two hundred dollars per acre, and bought for the growth of grapes. Here the climate is better for grapes than there. That grape culture in the right place, and rightly managed, is very profitable every reader of agricultural papers knows.

PEACHES

do remarkably well throughout a large portion of Texas. I have seen and raised larger and better peaches here than I ever saw in the markets of New York, Philadelphia and Washington, and I have seen some of the best peaches sold in those markets.

In my orchard, near Austin, I have a succession of ripe peaches from the last days of May until the middle of November.

In Cherokee county, there is largely grown a kind of peach, which is called Briggs' never-fail, because it never fails to bear annual crops of fruit—good fruit. This is owing to its habit of late blooming, nor does it put forth its blossoms all at once, but in succession, and thus yields fruit for several weeks of the summer. This has been its habit for more than twenty years. I was told, in the town of Rusk, that these peaches were annually sold without fail in their market. Dr. Yoakum, of Larissa, told me that he visited Mr. Briggs, in whose orchard it originated, and Mr. B. said that he had never failed a single season to have peaches from these trees for the last twenty years. This being so, this peach is a great acquisition in our climate, where the peach generally fails, on account of spring frosts, once in three, or once in five years.

APPLES.

North of the latitude of Austin, throughout a large portion of the State, apples do well, the early and summer varieties succeeding the best. Good apple orchards are quite common in Eastern and Central Texas. In the latitude of Austin and southward, many suppose and say that it is useless to attempt the culture of the apple. Thus I was told and so believed, yet I planted a few apple trees. They did well, and I planted more, and I now have an orchard of nearly three hundred apple trees, all growing finely, and I let them grow, not pruning any, except to keep the root sprouts below the graft from growing. I planted thicker than the nurserymen direct, only ten to twelve feet apart. By permitting low limbs to grow they shade the body of the tree; by planting thick, in a few years they will shade each other. The trees bear fruit—fruit according to the descriptions of the different varieties in the nursery catalogues. The trees were bought from Southern nurseries, and many of them are kinds which have originated at the South. The orchard was planted from three to five years ago, in a dark, sandy soil, in the valley of the Colorado.

Many apples have been planted in various parts of the State, from Northern nurseries; and experience teaches that many Northern kinds are failures here. Others plant trees in places unsuited to the growth of the tree, and more, they do not take care of the trees; consequently many of them die, and the remainder do not thrive or bear fruit. Then they say apples will not grow and bear good fruit in Texas. There are now many such people throughout the State.

Excellent winter apples are grown in Northern Texas. At the Lamar Nurseries of Mr. Walker, near Paris, I saw a very fine apple orchard in full bearing, many of the trees loaded with large fine apples. From this orchard, Mr. W. has good ripe apples the year round. At Mr. Walker's, and a neighboring nursery, were about 200,000 young apple trees, a large portion of which will be planted this winter; for the people of the State are awake to the importance of fruit culture. Other nurseries, one or more of which are near every large town, have their stores of trees for sale.

PEARS

are being planted quite largely in some portions of the State. One man is planting fifty acres to pear trees, near the Central Railroad, south of Dallas. At the Lacy place, at Dallas, I saw an orchard of 1200 pear trees, all of which were doing well. Near Austin, I have an orchard of 1000 pear trees growing finely, and some of them bear fruit at the ages of from four and five years. The pear stands the drouth better, and is less liable to the attacks of insects than the apple. Young apple trees require watching to prevent the borer from destroying them. This insect lays its eggs in the bark at the surface of the ground; the eggs hatch and the grub eats into the tree and often kills it. As remedies, applications of strong soapsuds are recommended. To make sure, many watch their trees, destroy the eggs or kill the grub by digging in with a sharp knife, or inserting a wire.

Plums of the Chickasaw family do well. Most others do not.

CHERRIES

are also failures, except in the more northern parts of the State, where some of the forms of Murrills do pretty well.

Currants and gooseberries failures.

BLACKBERRIES

are indigenous in Central and Eastern Texas; hence, when cultivated, they grow and bear finely. In Leon and some other counties, I saw bushels of large ripe blackberries last summer during the first days of June.

RASPBERRIES.

None are indigenous in the State, nor do any of the kinds succeed well in cultivation, excepting the blackcaps, some of which, in shady places, with good culture and rich soil, bear well, as has done the mammoth cluster near Austin. The blackcaps do very well in Central, Eastern and Northern Texas, where, also, are grown fine

STRAWBERRIES,

which, to succeed well near Austin and westward, require shade and moisture and some good culture. This done, good crops are the result.

FIGS

do very well, the only drawback to their culture being their liability to be killed down by frosts in most of the region north of the latitude of Austin. Gov. Throckmorton told me that he knew of a farmer in Northern Texas, who protected his fig trees from the cold by stacking his fodder around them. He had a yard enclosing his fig trees, and in this placed the fodder. In the wheat, oats and barley region, the straw might be placed around the fig trees, and the trouble would be well paid for, in plenty of luscious figs during the summer. Enough care has not been given to this fruit, and to the selection of the better kinds. I have twelve kinds, which give fruit from the first of June until the frosts of November and December, some of the figs being nearly three inches in diameter.

ORANGES.

In the southwestern part of the State, near Brownsville, the orange does very well. At Galveston, they grow in the open air and bear fruit. It is probable that the culture of this fruit may be made profitable on some portions of the coast of Texas, and if so, so can the

LEMON,

with equal, or even greater profit.

Fruit culture depends much upon soil and climate, and much more upon the proper selection of varieties, and, when planted, their after management; hence one person succeeds and another fails, and both have similar soils in the same neighborhood.

VEGETABLES.

All the vegetables grown at the North, with the addition of many more peculiar to a Southern climate, are cultivated in Texas.

Considerable attention has been paid to the growth of onions in San Saba county during the last four years, and with wonderful success. Mr. Ward told me that 45,000 pounds of El Paso onions can be made to the acre there. He made over 13,000 pounds the past season, which was not a favorable one, nor was the culture what it ought to have been. Two onions were grown there, one of which was 6¼ inches in diameter, and the other 5⅝ inches ; six onions weighed on an average more than two pounds each. One man can tend an acre of onions. At San Saba the onions sold at from 3½ to 5 cents a pound. He also said that onions can be kept from rotting, by being careful not to bruise them, and also keep them on racks, not in heaps, giving them light and air, and dry air.

To raise them, the ground must be irrigated. Near the town of San Saba there are over 1000 acres irrigated, under cultivation. It was cheerful and pleasant to see the growing things on these irrigated lands ; vegetables, fruits and flowers. There are many thousands of acres in Western Texas, which can be irrigated and made equally productive. San Saba county has sixteen large everflowing springs of good clear water, some of which give water power enough, and more than enough, to run large flouring mills, as is done by the beautiful springs at the town of San Saba.

COTTON

is more generally grown than any other plant, with the exception of corn.

In the middle and southern parts of the State, especially the latter, much damage has been done by the cotton worm, so much so, as in some seasons, to make the expenses of cotton planters greater than their incomes.

To destroy the worm has been a great desideratum for many years. Mr. Simpson, of Columbus, Colorado county, who was me in the survey during the summer, writes as follows:

Columbus, Texas, Nov. 3, 1874.

Dr. S. B. Buckley:

Dear Sir—Since arriving home I have made careful enquiries concerning the "*Cotton Worm Destroyers*" used. The principal have been Johnson's "Dead Shot," "Royal's Cotton Worm Destroyer," and Paris green, and arsenic, either in solution with water or mixed with flour.

I informed you of my experience with "Royal's" patent when with you, and my success. From those who used it this year, I find it has been equally successful. Some planters saying that it is the *surest.* My brother-in-law, Mr. McCormick, used "Johnson's Dead Shot" this year and it proved entirely satisfactory. It is, I believe, generally preferred on account of its cheapness, it only costing some 8 or 10 cents an acre, while "Royal's," (Paris green mixture) costs $1 00 to $1 50 an acre.

Either, when applied according to directions, will without doubt kill the worms. *Arsenic* has also been used in lieu of *Paris green*, with success. The worms did not attack my father's place this year, hence nothing was used. I enclose Johnson's circulars, which shows illustrations of machine used. Friench Simpson.

These remedies will make cotton a more certain crop than it has been.

In some few instances, in various parts of the State, small patches of cotton die in the summer months, often after the plant is in bloom, no one can tell why. I have been often requested to tell the reason.

I do not think it is in the soil, because the plants die in far distant parts of the State, when growing on different soils. Some may say that although these may be quite different, yet they may have the same chemical ingredient which kills the cotton. Very true, but then in the same spot, or nearly the same, I saw plants side by side, the one wilted and dead, the other alive and flourishing, and this extending through a large portion of a big cotton field, about twenty miles west of Dallas, on the road to Fort Worth.

The dead plants extended over two or three acres, side to side with those that were healthy. It seems to me unreasonable to suppose that a poison could be so unequally placed in the soil; and more, remain inoperative until the plant is grown, or nearly grown, and then be taken by the plant in such large quantities as to cause sudden death, for the plant may seem well one day, and be withered and dead the next.

Fruit trees and portions of hedge rows wither and die, and none can tell why. At Mr. J. O. Crutchfield's, about three miles east of Dallas, in a certain portion of his orchard, both apple and pear trees had suddenly wilted and died. Two young apple trees had recently died, one the day before I was there. These were dug up and their roots examined. At the base of the tree, extending down the larger roots, between the bark and sap wood, extending into the wood, were the paths of termites, and the insects going through them in crowds. Both of the trees were similarly effected; hence it seems very probable that the termites caused the death of these trees. Certainly they had began work on the tree which had died the day before, long previous to its death. These termites or white ants, belong to the same genus as the white ants of tropical countries, which are so destructive to wood. I think that both the cotton plants and trees were killed by insects, for even insects which are invisible to the naked eye, may be so numerous as to do considerable damage. They drink the juices which are the life blood of the plant.

CORN.

With good culture corn is a sure crop throughout most of the State. Even in the dry climate of Western and

Northwestern Texas, good crops are made by early planting, deep plowing and good tillage. The last summer, an unusual dry one, so dry that some raised little or no corn, yet others raised good crops in adjoining fields. I was told of one man in Parker county who raised nearly forty bushels to the acre last season, and his neighbor across the way did not raise five. Mr. Medlar, who has a large farm and stock ranche in Young county, told me last fall that he had not failed to make enough corn on his place for home use during the last twenty years; he uses a great deal, having 15 to 20 horses and mules, and 3000 to 4000 head of cattle. I give these examples from what is generally thought to be the poorest part of the State for the growth of corn. That big crops of corn are annually grown in the central, eastern and southern parts of the State, is well known to our citizens.

WHEAT

is grown in most of the State, in the latitude north of Austin, and some little in the more southern counties. Its culture is largely on the increase. Last fall, in traveling through many of the northwestern counties, we frequently saw stacks of wheat and oat straw, the threshing having been done. The usual yields of wheat-growing regions are realized, ranging from 5 to 40 bushels to the acre.

OATS

are now largely grown, much more so than ten or fifteen years ago. Last spring I saw some very fine oat fields in Robertson county, one on the farm of Esquire Moore, at Bremond, had oats about five feet high, thick standing, promising a yield of fifty or more bushels to the acre. Col. Whaley, in the northern part of Clay county, on the Red River, told me that he had raised eighty bushels to the acre.

BARLEY

is also grown in some sections, especially by the Germans. It is used largely for making lager beer, and also for feeding stock.

RICE.

is grown to a considerable extent in some of the counties in southeastern Texas. Tyler, Polk and Trinity counties are the largest growers of rice. According to the census report nearly 14,000 pounds of rice were grown in the county of Tyler in 1870.

SUGAR CANE

can be grown in the country, south of the latitude of Austin. In Central and Eastern Texas, it has been grown still further north. Texas has a very large area suitable for the growth of the cane, probably larger than any other State. Now that less expensive machinery has been introduced and used, for the manufacture of sugar, machinery, so cheap that the farmer of small means can have it, the culture of the cane will soon largely increase, because it can be made a very profitable crop; 1200 to 1500 pounds of sugar to the acre not being an unusual yield, besides molasses, and, it is said, that the molasses will defray the expenses of culture.

TOBACCO.

Comparatively but little of it is grown for market; but nearly every farmer, especially those who till but a few acres, and use tobacco, such men raise their own tobacco. Notwithstanding the much which has been said and written against the use of tobacco, it is more universally used than any other plant, its use being very common on both continents. There is not the least doubt, but that it may be made a large paying crop in many portions of the State. It is now grown to a considerable extent in Montgomery, Panola and Tarrant counties, Tarrant in the northwest, Panola in the eastern, and Montgomery in the southern part of the State, showing that tobacco can be grown in the State throughout a wide range of territory.

BEES.

Fruit trees are being planted largely, and already orchards are common, and these fruit trees have flowers; besides the woods, the fields and the prairies have thousands of flowers, all of which afford food and honey for bees. Besides, experience proves that bees in orchards increase the yield of fruit, by going from flower to flower, and scattering the pollen, so as to fertilize and start the growth of the young fruit; hence, the keeping of bees ought to be general, and not limited to here and there, a family as is now the case throughout a large portion of the State. Improved hives, with movable comb frames, should be used, and every body can make such now without infringing any patent.

SUMACH.

There are several species of this shrub, or small tree, growing in the State, two of which yield leaves, twigs and bark, useful for tanning. These are the rhus glabras and rhus typhina.

In Texas, there are several tanneries, and there ought to be many more, because the hides are here, and the material to tan them, and a home market for the leather.

There is a large tannery at Dallas, owned by the Dallas Tanning Company, who have a capital of $10,000. For tanning they use gambier, or Terra Japonica, the extract of oak bark and sumach. The gambier comes from Sicily. The sumach of Texas is used, for which they pay one dollar per hundred pounds of cured leaves, or $20 per ton.

The price of ground Virginia sumach is $60 per ton. Texas sumach can be ground and sent north at about 25 per cent. profit, as the market now is, (July, 1874.) Say $20 per hundred for the dried leaves and leaf stems, $5 per ton for grinding, $5 for sacking, and $15 for freight, leaving a profit of 25 per cent.

A first class sumach mill can be bought and put up at Dallas for about $1200, to which must be added the cost of the engine. Such a mill will grind from one to two tons per day, varying, as the condition of the sumach may be. The Dallas company have paid as high as $110 per ton for Sicilian sumach, but they have ceased to use it, finding the Texas sumach to be much the cheapest.

The leather made by this company is said by the Dallas shoemakers to be superior to most of the imported leather, and equal to the best; hence, the company have a home market for all the leather they can make. At their present rate of manufacturing they will make $160,000 worth of leather annually. Enough sumach grows in the county of Dallas to supply several such tanneries. There is no tree or shrub more widely diffused in the State than the sumach, and none so plentiful.

HEDGES.

There is no plant so suitable for these as the bois d'arc, or osage orange, (Maclurea aurantiacæ). A native of Middle or Northern Texas, it is at home here. Deeprooted, it thrives in both wet and dry soils, its native places being generally in valleys and along streams. It is a small tree, sometimes one to two feet in diameter, and thirty to forty feet high. Its timber is very durable, hence, it is valued for fence posts and for railroad ties, for which purposes its cultivation would be profitable.

Near McKinney and Dallas, and counties farther north, I have seen fine hedges during the past summer. Mr. Sims, who is a native of Georgia, now living in Grayson county, has a hedge of the bois d'arc pruned up to the height of ten feet, and so thick at the bottom, that it will keep a rabbit out. The hedge of Mr. Graves, in Collin county, near McKinney, is four years old, and proof against hogs and cattle. He says, his dogs, in running rabbits, often run them against the hedge, and catch them. Dr. Foote, the member of the House of Representatives from Collin, says, he knows of bois d'arc posts which have been in the ground twenty-two years, which are still sound and show no evidence of decay. The soil of Collin county is mostly a dark prairie limestone, three or more feet deep. Dr. Foote says, that land on the old farm of Gov. Throckmorton's father, which has been cultivated with little or no manure for thirty-five years, produces as well as ever. Collin county lands give from 25 to 40 bushels of corn to the acre, and cotton, from one-half a bale to a bale of 500 pounds. I give this as a sample of a large portion of the lands of the cretaceous region.

Near Austin, I have a fine hedge of bois d'arc, strong enough to turn cattle and hogs. It is five years old, from the seed. I have tried the pyracanth, and find it not strong enough, nor will it thrive during dry seasons. It may do better in the eastern part of the State.

The reason why so many fail with the bois d'arc, is that they do not trim it enough, nor cultivate it enough by preventing other things from growing with it. I know that there are many good hedges in the State, and there would be many more, had they been rightly managed ; for what has been done can be done again. Plant thickly, six to eight inches apart ; prune well for the first four or five years, and the bottom stems will soon be so large and close as to form an impenetrable fence to man or beast. To have such fences, especially around orchards, will pay well for all the trouble and care required to make them.

NOXIOUS INSECTS, SNAKES, ETC.

In some letters which I have received, inquiries are made about these in Texas. Tarantulas, centipedes, scorpions, snakes, etc., were the terror of my wife when she first came to Texas, but the experience of years has taught her not to fear these things. They are seldom seen and rarely do any harm. I have never known any one to be killed by them, and very few to be injured in the least. When engaged in the survey, and sleeping on the ground at night, as has been my practice for most of three summers, I have never been troubled with any of these things.

The common house fly, mosquitoes and ants are the greatest pests. To these may be added the grasshoppers in the northwestern part of the State. In Central and Southern Texas, in the latitude of Austin, and southward, the cutting ant is troublesome; so much so as to destroy fruit trees, rose bushes and shrubbery. To destroy the ants, some dig them out and burn them up; if all the females are killed—these are the large winged ones which keep under ground in their cellars—then the town or den is destroyed. Recently a cheap and effectual method has been adopted to destroy them. It is by driving the fumes of sulphur and carbolic acid into their underground apartments by means of a bellows. Some make it their business to do this, and they are doing a good work.

SHEEP

are largely kept in Texas, but not near to the extent they should be. There is no stock which will give quicker and surer profits than will sheep, rightly placed and rightly managed. They do the best in dry uplands, where there is plenty of water; for, contrary to what many suppose, sheep need drink; not but that they will live on dewy, green grass, in places where there are no streams or springs, but they will do the best in hilly regions where they can have access to plenty of water. So Kendall told me, and he was one of the most successful wool growers that ever kept sheep in Texas. In western Texas, in what is now Kendall county, he invested three thousand dollars in sheep and lands, the land costing but little more than the expense of surveying. In ten years that investment, above all expenses, had increased to the amount of about eighty thousand dollars, giving an income of ten thousand dollars annually. To take care of his sheep, Kendall had Mexicans and shepherd dogs. One shepherd and a dog would take care of from one thousand to twelve hundred sheep, the sheep being put in pens at night as a protection from wolves. Most of these animals had been destroyed by feeding them fresh meat and strychnine. Every spring, after shearing, the sheep were dipped in tobacco water to destroy ticks and prevent scab. The start was made with healthy sheep, and thus they remained. One hundred acres was fenced, where the summer grasses were permitted to grow for winter pasturage. In this enclosure were shelters to protect the sheep from storms. This hundred acres was the hospital where the weakest and poorest sheep were placed, and they very rarely failed to be cured.

Many others have bought sheep, and by neglecting to have the proper care taken of them, have lost money in the investment, and some have bought diseased sheep, and also lost money. Such men decry the business, and say there is no profit in it.

The Chamberlain Brothers started a sheep ranche in the corner of Milam and Bell counties, in 1860, During the war their losses were about equal to their gains; but since then the profits in the investment have been large. From a statement in the Austin Statesman, it appears that this ranche was bought two years ago by Mr. T. F. Fowler. "He paid for the ranche, consisting of 1300 acres of land and 3700 head of sheep, $22,400 gold. The first year's clip brought him $6000; the second $6,200; meanwhile he has sold $3,200 worth of bucks, and $3,000 of ewes, and has now his original number, less one hundred."

Last September, I met with an intelligent and wealthy Englishman, who had resided many years in Australia, and was well acquainted with the sheep business of that country. He has now settled with his family in Parker county, about 12 miles east of Weatherford, on the Clear Fork of the Trinity river, where he has started a sheep ranche, thinking Texas is better for that business than any land he has ever seen.

In the New England States, and in other northern States, sheep are kept on lands valued at $50 and $100 per acre, and money made in the business, and that too in a climate requiring costly shelters, and the feeding of hay and grain more than six months annually. Certainly much greater profits can be realized in Texas, and it has been done, as is proven by the preceding examples.

CATTLE.

Many improvements are being made in this, the most important and largest branch of the stock business in the State. Now most of the men having large droves of cattle have herdsmen, whose duty it is to guard and watch the cattle. Others have and are having their lands fenced, as is being done by King, and others in the southwestern part of the State. In the stock regions of the northwestern settled portions of the State, most of the cattle are herded. This is said to have become a necessity, on account of numerous cattle thieves.

Mr. Yarborough, living near Sherman, in Grayson county, is said to have about 4000 cattle ranging in the counties west of Grayson, all guarded by herdsmen. He sells his cattle mostly at Sherman, from which place many are shipped by railroad to other points.

Mr. Medlar, who has several thousand cattle in Young county, sold his four year old steers last year at $17 00 each, three years old $13 00, cows $11 00 to $12 00 each. He has between 400 and 500 cows, but milks no more than enough to give milk and butter to his family; and this is the custom of Texas large cattle raisers.

Improved breeds of cattle are being brought into the State—Durhams, Brahmins, Jerseys, etc. Hon. Web. Flannagan, of the Senate, has some fine Jerseys, and Jersey cows are most prized as milkers, some few preferring the Alderneys, as giving the most milk, but that of the Jersey cow is said to be the richest. The Jerseys are perfectly hardy here, and their introduction is a great acquisition. Not so with the Durhams, which have died in some sections, not being able to endure the continued warm weather of summer. Some of them have become acclimated, and are doing well. It is said that Durhams imported in the fall do much better than those brought here in the spring.

The Brahmins do well. This breed was introduced into the South many years ago, at the suggestion of Dr. Bachman, of Charleston, S. C. Durhams had not done well in South Carolina—therefore the Brahmins were imported. These are said to be superior to other cattle as workers, some asserting that they are equal to mules in this respect, but the cows are not noted as large milkers.

Last summer, I saw some fine Durham cattle at Mr. Still's, near McKinney, who has made, and is making, large importations of improved cattle, horses and hogs.

The native cows of the State can be much improved as milkers. This is being done to a considerable extent, and much more can be done by selecting the heifer calves of the best cows for future milch cows.

A few years ago, there was published the statement of a mechanic, who bought a Texas cow, and he was much disappointed to find that she gave but two or three quarts of milk. He bought some bran at a mill and gave her two or three quarts of this, mixed with water, night and morning, and the result was, that in a few weeks she gave more than six quarts night and morning.

SWINE.

A marked improvement has been made in hogs during the past few years. Burkshires, Poland, Chinas and other breeds are now common in a large portion of the State. The people have learned that the keeping of these breeds give the largest profits. Not near enough hogs are kept in the State for the wants of the people, large quantities of hams, bacon and lard being annually imported. This ought not to be: More hogs should be kept, and they should be better kept than they now are. Last spring, I staid all night with a small farmer, in the southern part of Limestone county, who owned only about fifty acres. At night, he called up about forty large hogs, and fed them a few ears of corn. They were the best forty hogs I ever saw at any one place in Texas. He fed them a few ears of corn again in the morning. This has been his practice for years, and the result is he annually sells several hundred dollars' worth of bacon, and realizes a large profit. By having his hogs at home at night, they are not liable to be stolen, and, kept in a growing condition, it takes less corn to fatten them in the fall.

HORSES.

Many fine horses have always been kept by the people of Texas; hence, there is comparatively little improvement needed in this respect. The raising of horses could be made very profitable on the grassy plains of the State, were it not for thieving whites and Indians. The raising of horses is now quite largely done, where the thieving Indians do not come.

POULTRY.

Almost all kinds abound and are easily raised and kept. Wild geese and ducks are here in the winter, and wild turkeys are common in the less settled regions.

HOG WALLOW PRAIRIE.

In some portions of the State, in dark, sticky, limestone soils, are the peculiar depressions known as hog wallows. These are well known to most of our citizens. Several theories have been advanced to account for these "wallows." The past summer was unusually dry in many parts of the State, and large cracks were made in all soils abounding in "wallows." Big rains came, flooding many parts of the country. Afterwards, in passing where the hog wallows prevailed, we could see plainly how they were made. The holes made by the cracks were being filled in part by the washing in of loose earth, made loose on the edges of the cracks by the rain, and there not being sufficient earth to fill the very deep cracks, depressions were made. These things were repeatedly seen by the members of our party, and left no doubt in the mind of any one as to the cause of "wallows."

This corresponds with what was told me by some of the most intelligent citizens of the State, in 1859 and '60.

I have never seen any of these peculiar wallows in sandy soils, or any soils which do not have large, deep cracks in extreme drouths.

MOUNTAINS—ELEVATIONS.

In Northern Texas, the highest poinst above the level of the sea are only about two thousand feet.

According to the engineers of the Texas Pacific Railroad, Phantom Hill is 1597 feet. There are many other higher points in that vicinity. Railroad surveys through Young county show an elevation of from 1000 to 1300 feet at Graham and vicinity. Some of the highest points near Fort Belknap are probably nearly 1600 feet. With a spirit level, I measured one of the highest points on the Brazos river, about three miles south of the fort, and found it to be 325 feet above the river. This is above and north of Graham, which is in the valley of the Salt Fork, three miles above its junction with the Brazos, to which, from Graham, it flows with little current, not having a fall of more than ten feet; hence the hill below Belknap is only about 1500 feet high.

From Fort Griffin northwestward, into Haskell county, the road goes up a succession of hills until beyond the Clear Fork of the Brazos a plateau or table land is reached, from which rises here and there a hill. This table land has probably about the same elevation as the Staked Plains in the adjoining territory, or county of Young, at the west, but a few miles into which we could see from some of the hills of Haskell. Large herds of buffalo were feeding on the grassy plains, and also on the hills and in the valleys—an interesting and pleasant view.

That portion of the State east of Trinity river is called Eastern Texas; Central is between the Brazos and Colorado rivers, and Western west of the Colorado river. Lands in Eastern Texas can be bought at from one to fifty dollars per acre; however, not much land is valued as high as $50, except small places with good buildings and improvements; the average rate of farms being at from two to ten dollars per acre. We found more vegetables and fruits in the central and eastern portions of the State than in the western, where stockraising is the main business. Central and Eastern Texas abound in fine streams and springs. It is a land adapted to a varied agriculture—to the growth of the small grains, in addition to that of corn and cotton. It is one of the finest countries in the world, especially for the growth of the grape, for which the iron-clad hills are peculiarly well adapted. The average yield of cotton per acre is about 250 pounds, or one-half a bale; yet frequently more than a bale is grown. Of corn, about twenty-five bushels per acre; often much more, and frequently less. Experiences teaches that men with small farms, who practice a varied agriculture, have most of the comforts of life and the least trouble; because the large land owner has either to hire or rent out his land, either of which is a troublesome business, as is well known to many large planters, who have either whites or negroes to work their lands.

TILLAGE OF UNFENCED LANDS.

In the northern part of the State, in Clay, Wichita and other counties, there is a prairie land with very little timber—not enough for fencing purposes; hence, by mutual agreement of the settlers, the cattle are guarded on the prairie by day and shut in enclosures at night. A boy on horseback will herd several hundred. A boy is hired at from twelve to fifteen dollars per month. Col. Whaley told me that the expense of herding his cattle amounted to only twenty-five dollars per month, boy, horse and keeping of them included. Col. Whaley is a large grain grower, and for his grain he has a home market—from the government troops on the frontier, and at Fort Sill, in the Indian Territory, or rather on the Reserve, as it is called. His place is near the junction of the Big Wichita and Red River. The past season he raised 10,000 bushels of oats; wheat, 1500; corn, 1200, and barley, 50 bushels, the last being but the commencement of the culture of that grain to obtain seed to sow next spring. He grows the black variety of oats, which are hardy, more sure, and a heavier grain, so he thinks, the average yield being about fifty bushels to the acre, which he generally sells at his graneries at about one dollar per bushel. At the time of my visit, in September, 1874, he had contracted the crop at ninety-three cents per bushel. I never before saw such an amount of grain, at any one place, all threshed and in graneries; and all the grain was of a superior quality, excepting the wheat, which had only a medium grain. He says he has raised as much as one hundred bushels of oats to the acre. His wheat this year gave only from fifteen to twenty bushels to the acre, the average being about seventeen. He expected to get forty bushels to the acre, but the drouth began much earlier than usual, which made the wheat crop short throughout a large portion of the State.

Corn, he raises, on an average, about twenty-five bushels to the acre, which is the yield this year with less rain than usual. Has grown as high as sixty bushels of corn to the acre; raises the yellow variety, which is mostly grown in Western Texas, because it ripens early before the usual drouths of summer.

Col. W. raised last year 15,000 bushels of grain. He is the largest grain grower of that region. Has six neighbors who are engaged in the same business, most of them being beginners there. His neighbor, Col. Stratton, has several hundred acres in cultivation. Col. S. went with us into Wichita county, and to him I am also indebted for much valuable information. Improved agricultural machinery is there used. The soil is a light sandy loam, being very easily tilled after the first plowing. One man, with gang plows, can plow six to eight acres a day, and one man can till upwards of fifty acres. The land is very fertile, deposits of the Red and Wichita rivers, containing gypsum and other fertilizing salts. Between 1000 to 2000 acres of lands, unfenced, are in cultivation in that neighborhood.

About nine miles southward, on the Henrietta road, several hundred acres of unfenced prairie were being plowed for wheat, oats and barley, and also corn. On the Little Wichita, are several hundred acres of unfenced lands in cultivation.

I was agreeably disappointed in regard to that Wichita region, having supposed it to abound in poor water to such an extent as to make it undesirable for a residence. On the contrary, it is well watered; has plenty of fine springs and streams of good water. A whitish sandstone underlies the limestones and soils, and from this sandstone comes an abundance of good water, fine large springs, of which some are at the town of New Henrietta, and other places. At the Gilbert place, in Wichita county, are extra fine springs.

This Wichita country is a beautiful fertile prairie land, just uneven enough to give beauty and variety to the scene, the prairies being skirted with timber along the streams, amply sufficient for fuel, and rocks enough for building purposes. Millions and millions of untilled lands are there, lands as fertile as those cultivated by Stratton, Whaley and others. It is a land where farming is less expensive than where it is necessary to have the fields fenced. A few neighbors can join and hire a man or boy to herd their cows and other stock, and by living near each other, be a mutual protection from the Indians. I know of no portion of the State in which the colony system can be adopted with better advantage than there.

The greatest objection to that region is its liability to be invaded by grasshoppers, from the northwest, in the months of September and October, not, however, until the grain crops are made, and the cotton partly so. I would not grow cotton there. Col. Stratton had one hundred acres of cotton, from which the grasshoppers had eaten most of the leaves, the stems only having cotton opened and unopened of about one-quarter of a crop. The grasshoppers came sooner than he expected this year. Next year he will not plant cotton. It may be that some of the things used to kill the cotton worms will also destroy the grasshoppers, but they could only be partially fed with the poison, because they spread themselves over the land everywhere; however, they crowd the most where they can get the food which they like best, preferring certain trees and plants. They like the leaves of the pecan, and these they devour, leaving those of the postoak untouched. This year the grasshoppers from Kansas spread themselves over a few of the northwestern counties of the State, extending as far south as Young county, west and south of which we saw comparatively few of them. They seldom do any damage in Texas before the months of September and October, when the northwestern winds occasionly blow and bring swarms of grasshoppers from the northwestern States. It is fortunate that they come no sooner, but after the crops are made; hence, there is no probability of famine ever being caused in Texas by grasshoppers.

The grasshoppers, the past season, after destroying the crops of the farmers of Nebraska, Kansas and other places, came on to Texas, but too late to do much damage here. Consequently, about 40,000 people in those Northwestern States are said to now need aid in supplies of food to prevent them from starving. Already cold winter is with them, and extreme cold weather prevails there, hence much suffering must be endured by that people.

Contrast that with Texas, her delightful climate, with health giving breezes and fertile soil, yielding material for all the necessaries and comforts of life, with moderate labor—no more than is required to give health and enjoyment. A home here, or a home there; which is preferable? Give me Texas; yes, give me a residence in Texas, in preference to any of the Northern States, with their more than six months winter. Born in western New York, and living there, my life's blood became chilled in the winter time. I was diseased. I came South, and finally to Texas. Health and strength came back, and have remained with me.

I have received many, very many, letters of enquiry about Texas, most of which are answered in the preceding pages. A common question is, can a person of industrious habits, with little or no means, acquire a competency here? Many such persons have done it here, and many more are doing it. I will give a few examples, taken from different parts of the State:

About six miles west of the town of Graham, in Young county, on the Brazos river, is a farm of 750 acres. Three or four years ago, it was rented by three young men from the State of Georgia. Two were brothers of the name of Brooks, and the other is named Taylor. They were to give one-fourth of the crop for rent. They planted corn mostly, and sold the corn raised, over two thousand bushels, at one dollar per bushel, at home ; paid $500 rent and bought the farm with the $1500. This was told me by Mr. Medlar, who, as agent for the owner of the land, did the business with them. The brothers Brooks now own the farm, and one of them has recently married, and the other is about to get a wife. With Messrs. Graham and Medlar, of Young county, I visited this Brooks farm, which is finely situated in a curve of the Brazos river. Their houses are amid live oaks overlooking the farm, and commanding fine views of the Brazos valley and hills, and plains beyond.

A young man there, living with them, has tilled fifty acres of corn the past season, (1874), and I was told that he had made about 1200 bushes of corn. That being a stock region, corn commands a good price there, being $1 per bushel last September.

In the southern part of Limestone county lives a widow of the name of Cox. Her husband died a few years ago, and owing to some defect in the title, their little farm of forty acres was unpaid for. She had three daughters, nearly grown. They raised a crop of cotton, did all the work, and the money for which the cotton was sold, paid for the place, at $5 per acre. It is now worth much more, being dark, rich land ; a comfortable house and good orchard of apples and peaches, all the land well fenced.

Some few negroes have good farms, and quite a number of them have good, comfortable homes, all of which they have made since they became free, at the close of the war. As a race, they are improvident, taking little thought for the morrow, hence, most of them are very poor.

Many Swedes and Germans have made for themselves good homes in Texas during the past few years. Much depends upon the man. A person with industry, economy and good management, can, in a few years, secure a good home in almost any part of Texas.

I have merely glanced at the botanical wealth of Texas, which, if properly used, with the addition of a few foreign things in common cultivation, is amply sufficient to ornament and render pleasant the grounds of our people, both in towns and country. Who would not rather see a cheap little cottage amid trees, shrubs, fruits and flowers, than a palatial mansion without them?

The red cedar is very hardy throughout Texas, is one of the finest evergreens, and can be pruned and trained into almost any shape, as has been done in Nacogdoches county, especially in the old town where great attention is given to the ornamental part of horticulture, causing beautiful flowers, trees and shrubs to abound in the grounds around dwellings and along the streets.

In almost every portion of the settled region visited by the survey during the season, there are many pleasant abodes placed amid trees and shrubbery, but not near as many as there should be. Such things cost comparatively little, and, not only give pleasure to their owners, but to many others.

A neat and convenient residence, with a good library, some newspapers and periodicals; the house embowered among vines and shrubbery, has many of the elements of true happiness. Let all strive to make home pleasant, so that its inmates may prefer it before every other place; then the children will be apt to form good habits, and be a blessing to their country and their parents. Nothing will more tend to this result, than beautiful, rural homes, which can easily be made throughout a large portion of Texas.

Expenses of the Geological and Agricultural Survey, from May 1st, 1874, to November 1st, 1874.

OUTFIT AT AUSTIN.

1 pair mules, of Mr. Hart	$ 366 00
1 Ambulance	137 50
1 pair mules and wagon	330 00
1 pair of mules and hack, bought by Prof. Burleson, at Waco	675 00
	$1,508 50

EXPENSES IN THE FIELD.

May	$ 73 00
June	159 20
July	264 85
August	135 45
September	115 20
October	122 80
	$871 15

WAGES PAID.

James Horne,	$50 00	per month	$300 00
Shands,	25 00	" "	150 00
Carrington,	25 00	" "	150 00
Cook,	25 00	" "	150 00
			$750 00

S. B. BUCKLEY,
State Geologist.

WACO UNIVERSITY,
December 5, 1874.

Dr. S. B. Buckley, State Geologist of Texas.

DEAR SIR: I herewith submit my Report of a Geological and Agricultural Reconnoissance, made during last summer, through a part of Eastern, Northern and Middle Texas.

With acknowledgments due you for information, assistance, and many acts of courtesy,

I remain, yours truly,
RICHARD BURLESON.

REPORT

—OF—

Assistant State Geologist.

I left Waco on the morning train of the 1st of June, and at 3 o'clock of the same day I joined the Geological Corps, then in camps seven miles east of Bremond.

Upon consultation with Dr. Buckley, it was agreed that I should return to Waco the next day to purchase a second ambulance, having been authorized by Gov. Coke to do so, and having found it an absolute necessity to make our transportation adequate for the party. The next morning, accompanied by James Horne and Jack Coke, I returned to Waco. After looking around one day for a suitable ambulance and team, we made a purchase from Messrs. Jones & Orand, and at 2 o'clock, June 4th, we left Waco. That night we camped thirteen miles east of town on the Springfield road.

June 5th.—We traveled over high rolling prairies all day. Mr. T. J. Harper and Capt. W. R. Shea have fine farms lying along our route, which, with good seasons make 15 bushels of wheat, 75 bushels of oats, 30 bushels of corn, and two-thirds of a bale of cotton per acre, which is an average crop for the country. In their neighborhood is a good quality of building stone, which lies in beautiful seams 2½ and 3 inches thick, and can be quarried in plates, frequently ten and twelve feet square. Mr. Bryan, an experienced cotton raiser, living on our way to-day, has interested himself in testing the different varieties of cotton to ascertain the kind best adapted to the soil and climate of Texas. He is satisfied that the burr-cotton is the best, and that with proper culture and good seasons it will produce, on the river-bottoms and the black sandy prairies, two bales to the acre. He is certain it will double the yield of any other kind of cotton on the same soil and with the same culture.

At Horn Hill we found cretaceous fossils in great numbers. They are in limestone rocks, which are imbedded in a black loam sandy soil.

June 6th.—We crossed the Navasota river at the Rocky Ford. The bed of the river at this place is covered with rocks which are filled with fossils, such as we found at Horn Hill. We camped at night two miles east of Cotton Gin, on the farm of Mr. Pattison's, an old Alabama friend of mine, with whom we spent the Sabbath.

June 8th.—This morning I went with Capt. H. P. Davis to examine some deposits of coal and potter's clay in the neighborhood. The latter is found in the banks of a creek, and exists in great quantities, some of which is very pure and white. The neighbors use it for a whitewash. I have seen it used for painting. It is first put on as a whitewash and after it is thoroughly dried, the oil is applied with a brush. Thus used, it is a good substitute for white lead painting. The coal we found is brown coal. The first stratum is eighteen inches thick and about twelve feet below the surface, found in the bottom and banks of a creek. What I saw was very imperfect, from having been subjected to the action of running water. The second stratum which we were enabled to examine, from a well, is thirty feet belew the surface. It is five feet thick and of a much better quality than the first described. In this neighborhood Mr. Grover pointed out to me a plant, *silphum laevigatum*, the root of which, he says is a good remedy for rheumatism. The virtue of the root is extracted by putting it into pure whisky or brandy, after which, it is to be drank. Mr. Grover says he has seen it tried repeatedly and never knew it fail making a cure. I saw acres of land covered with this plant in the bottoms of the Trinity, two miles west of Dallas. Afternoon we went on our journey, and that night camped near Fairfield.

June 10th.—I gathered several new plants this morning. At 10 o'clock, we arrived at Butler, and called on Hon. H. Manning, who received us very kindly and took great interest in showing us his fine varieties of pears, peaches and plums. His plums were ripe and I can say, I never tasted better fruit of the kind in my life. His pears and peaches were not ripe; but, the trees were loaded with green fruit of the most promising character. I have never seen these varieties of fruit grown to greater perfection in any State than that of which these gave promise in Mr. Manning's orchard. This is one of the very best counties in the State for raising fruits of all kinds. The land is good, finely timbered and well watered. In the neighborhood of Butler, brown coal is found that does well for warming and culinary purposes; but, not for the forge or furnace, where great heat is required. Salt and soda springs are also found in the neighborhood, from which salt and soda were made during the civil war. To-day—afternoon—we crossed the Trinity river at Bonnor's Ferry and camped on Sweet Gum creek, five miles from Palestine.

June 12th.—Dr. Buckley arrived at Palestine on the train from Crockett last night, and came to our camp this morning. We were very glad to meet him. At 11 o'clock Drs. Buckley and Hunter and I went to examine a deposit of coal, eight miles west of Palestine, near the International Railroad. We found the coal cropping out in the banks of a creek at different places, for a distance of three or four miles along the stream. The stratum is four and a half feet thick and ten feet below the surface. It is a good variety of brown coal. Mr. Brooks was sinking a shaft 150 yards from the creek. He is well acquainted with coal mining in West Virginia and is confident of finding a valuable mine of coal here. In the neighborhood of Hon. —— Reagan's plantation, we found immense quantities, *mountains* of deposit of brown hæmatite, that will run, at least, 60 per cent. of metalic iron. Wood for making charcoal, in great abundance.

June 13th.—This morning, we left Palestine to examine some deposits of coal and iron ore in the northern portion of Anderson county. After traveling all day over rough roads, we reached the farm of Capt. Jas. Eastland, where we were kindly received and entertained by the captain and his good lady until Monday morning, when the captain generously offered to go with us as guide during the day. We found the coal cropping out of the banks of Caddo creek and neighboring hills, at three different places within a distance of two miles. The coal is of the same quality as that we found west of Palestine, near the International Railway; but, perhaps, not in the same quantity. We had no means of determining the thickness or area of the stratum, but supposed it not extensive in either direction.

The iron deposit is in the northeastern part of the county, in the vicinity of Kickapoo, where there was a furnace for smelting the ore during the war. The ore is the deposit brown hæmatite, and will run about 55 per cent. of iron.

June 17th.—This morning, at 11 o'clock, we arrived at Rusk, Cherokee county, where we met Senator Dillard, who received us very kindly, and introduced us to several parties, personally interested in having us examine certain localities in the county. Among them was Mr. Philleo, who owns an iron foundry, eight miles west of town.

Next morning, Dr. Buckley and I, with Mr. Philleo as guide, went on horseback to examine his foundry. The works are in a dilapidated condition; the cupel is only run occasionally. Surrounding the foundry, for miles in every direction, the mountains are covered and filled with a rich brown hæmatite, mixed with ochre. Water in abundance, with wood and limestone convenient and in sufficient quantities to run a foundry for a century. In the evening, we returned to town, and started on our way to Nacogdoches, which place we reached the next evening, after a hard day's drive over rough roads and through deep sand. Here, we rejoined the balance of the corps, from which we had separated near Bremond the first of the month. Nacogdoches is an old Spanish town, somewhat worn, but presenting an appearance of much taste and cultivation. I saw more fine shrubbery here than I have seen in any town in Texas. It grows most luxuriantly, *Talix Babylonica* (weeping willow) and *Acacia Julibrassin* (mimosa) growing to the size of trees two feet in diameter and thirty-five feet high.

June 20th.—Dr. Buckley and I, with Mr. John Durst as guide, went to examine a deposit of gypsum, but found none of any importance. The uplands of Nacogdoches county are poor, though, when seasons are favorable, they produce astonishingly well. The valleys and bottom lands are very rich, and are covered with the different varieties of oaks, hickory and walnut. They yield abundant crops of corn and cotton, with very little cultivation. This evening, we camped at Melrose. Dr. Buckley and I called on Senator Swift, who took very great interest in the survey, and gave us valuable aid and information.

June 22d.—With Capt. L. T. Barrett as guide, we went to examine the oil well and springs in the neighborhood of Melrose. No doubt, there is an inexhaustible fountain of oil in this section, which extends over five or six counties in the southeastern part of the State. To my mind, it is evident that nothing is needed but capital and the means of ready transportation, to make it a source of vast revenue to the State. This section of the State is rich in its soil, rich in its oil, and rich in its lumber; but wretchedly poor in its transportation. It is believed that the gray dawn of a better day is seen for this most neglected, but rich portion of the State. The St. Louis and Sabine Pass, and the New Orleans and Texas Railroads are pointing in this direction, and, when completed, will tap this rich country, and pour its vast wealth of cotton, and sugar, and oil, and lumber in the lap of the commerce of the world. We camped for the night on the Attoyar river, in San Augustine county.

June 24th.—Not being well myself to-day, Dr. Buckley took Mr. Simpson with him, and went across the country, to examine Mr. McClain's foundry, and to rejoin us the next day above Linn Flat.

June 25th.—In the evening of to-day, Dr. Buckley and Mr. Simpson got into camp, bringing some of the best specimens of brown coal and iron ore that we had found. They also brought a specimen of superior metalic iron, made at Mr. McClain's foundry. The country we saw today was generally poor, except that in the vicinity of Linn Flat, which was very good. A dense forest of pine covers the country.

June 26th.—In the neighborhood of Henderson, Rusk county, we examined a deposit of coal that crops out of the banks of a branch. The stratum is six or seven feet thick. We had no means of determining the area of the deposit. It is about ten feet below the surface, and is a good quality of brown coal. Coming back to town, Hon. Webster Flannigan received us most cordially at his house, and took very great interest in showing us his thoroughbred stock, consisting in hogs, cattle and horses. He has two imported Jersey cows, which, he says, will give each six gallons of rich milk a day. The Jersey gives the richest milk, producing the most butter, of any cow in the world. His Jersey bull is, certainly, the finest animal of the kind that I ever saw.

June 29th.—When we arrived at Overton, on the International Railroad, to-day, Dr. Buckley put me in charge of the corps, with instructions to go on to Tyler and make a survey of Smith county, while he went by rail to examine Young's foundry, near Jacksonville, Cherokee county, and Kelley's foundry, near Jefferson. We camped four miles from Overton, on the Tyler road. Pine is the principal natural growth of the country.

June 30th.—At 5 o'clock P. M., we arrived at Tyler. I called on Mr. George Yarborough and Mr. J. P. Douglas, who gave me valuable information of localities in the county, possessing geological interest. Tyler, the capital of the county, is situated in a swag or valley, between a chain of iron ore hills, running northeast and southwest, eight miles west of town, and two chains of iron ore hills, four and five miles east of town, running parallel with the first and with each other. Through this depression the Smith County Railroad runs, connecting the International at Troupe with the Texas and Pacific Railroad at Mineola. The ore in these hills is brown hæmatite, and will run about forty-five per cent. of iron. The quantity is inexhaustible.

Brook's saline is seventeen miles southwest from Tyler. This saline covers five or six acres of land. It lies in a valley surrounded with hills, in which are pockets of lime stone. Seven furnaces were run at this saline during the war, making one hundred sacks of salt daily. It takes 300 gallons of the water to make one bushel of salt.

The Steen saline is fourteen miles north of Tyler. It covers about ten acres of land, and is surrounded by high hills, in which limestone is found. Twenty furnaces were run at this saline during the war, making 12,000 pounds of salt daily. It takes 190 gallons of the water to make a bushel of salt.

There are several round mountains in this county, from 120 to 150 feet high, the summits of which are covered with a very hard brown sandrock, that makes a very fine building stone. Generally, there is found an old well at the base of these mountains, which, tradition says, the Indians dug in search for precious metals.

There are two kinds of soil in the county—the gray and the red. The red lands are the most valuable, producing, as they do, a greater variety of crops, and are more durable. The gray is a warm, sandy loam, and is better adapted to growing cotton. It will, when fresh, produce a bale to the acre, while the red soil will not make more than two-thirds of a bale.

There is a great variety of fine timber in the county, consisting of pine, maple, hickory, walnut, sweetgum, chinquapin and the different kinds of oak. Smith is one of the best watered counties in the State. It is bounded on the west by the Neches river, and on the north by the Sabine, and literally abounds in the most delightful and beautiful springs I ever saw. Many of them are chalybeate and sulphur, possessing medicinal qualities of great value.

Mr. Douglas told us of coal that had been found in two strata in the northern part of the county, on Silver Lake. The first stratum is about twenty, and the second about seventy feet below the surface. The second stratum is said to be fine coal.

July 6th.—Dr. Buckley rejoined us to-day. He gives a a good account of Young's and Kelley's foundries. From the latter, he brought some fine specimens of ore and metalic iron.

From Tyler we turned our faces towards Dallas, going by way of the Jordan saline, in Van Zandt county.

July 8th.—At noon to-day we arrived at the saline. It is one of the largest deposits of the kind in the world, covering four or five hundred acres of land. During the war, a thousand sacks of salt were made daily at this saline. Now there is but one furnace, which runs forty-two kettles, making daily from forty to fifty sacks of the finest and most beautiful salt, of two hundred pounds each. The water from only one well is used. The constituents of the water are, fourteen per cent. of chloride of sodium, a small proportion of iron and gypsum, with a trace of magnesia. One gallon of water yields one and a third pounds of salt. The wells on the saline are dug through eighteen feet of sandy soil. At this depth a thin stratum of quicksand is found, at the bottom of which is a hard pan, whence the salt water issues in a strong stream. The saline is owned by Mr. Sam Q. Richardson, a gentleman of public spirit and enterprise At this place, Dr. Buckley took the train on the Texas and Pacific Railway for Paris, Lamar county, to examine a coal deposit that had been reported to him as existing on Red River, twenty miles north of that town. The corps he left in my charge, with instructions to make observations in Kaufman and Rockwall counties, and to rejoin him at Dallas by the nineteenth of the month.

July 9th.—This morning there was a simultaneous burst of joy from the entire corps, when we came in sight of the vast and beautiful prairies of the west, and felt for the first time in eight weeks their delightfully cool and bracing breezes. What Mecca is to the Mussulman, the beautiful prairie is to the inhabitants of Western Texas. At night we camped two miles west of Cedar Grove, where we found the first cretaceous fossils that we had seen since we crossed the Navasota river, four miles west of Mexia. We found here limerocks cropping out at different places along a line running northeast and southwest, for a distance of ten or twelve miles. They were filled with gryphea, exogyra, inocramous and other cretaceous fossils. We were now on the western border of the ancient eocene sea. A line connecting Cedar Grove and Mexia, running northeast and southwest, will mark the general boundary between the tertiary and cretaceous formations in Texas.

The vicinity of Cedar Grove and Turner's Point is a most beautiful prairie country. The soil is a gray loam, easily cultivated and pleasant to live on. It yields fine crops of corn, wheat, potatoes, oats and cotton.

July 15th.—This morning we arrived at Rockwall, in Rockwall county. The town and county take their names from a noted rockwall near the town. We had the pleasure of meeting Captain Edwards here, who took much interest in the survey and gave us valuable information relative to the county.

The first wall is half a mile west of the town. When discovered many years since, it was above, or on a level with the surface of the ground; now, while it maintains its original line of general direction, it appears only in detached pieces scattered along the surface. Our principal examination was made in a well, which was, originally, thirty-seven feet deep, but now only about fifteen. The wall was cut into by digging the well. The parties who dug it expected to find hidden treasures at the bottom of the wall. It is believed by many that this wall was built by a former and now extinct race of people once inhabiting this country. The land on which it is found has changed hands repeatedly in a short time at increasing figures, from the belief that hidden treasures or precious ores are to be found at the bottom of the wall. I believe the impression is beginning to prevail that the land is more valuable for its fine soil, suited to growing wheat, oats, corn and cotton, than for the precious metals lying beneath. This wall is four inches thick, consisting of rocks from ten to twenty-four inches long, from three to ten inches wide, and four inches thick. It is perpendicular, and its lines of jointing, so far as we could examine, were perpendicular and horizontal, and as perfect as the joints of bricks in a wall of masonry. It is impacted on both sides by a very hard, blue, joint clay. In two places the joints in the clay are cut by the wall, showing that the clay was deposited before the matter of the wall was injected. The clay that presses against the wall on both sides is of a whitish cast for two or three inches out from the wall, proving that it has, in time, been subjected to great heat.

The wall is, doubtless, *augitic dike*, produced by a non-volcanic, igneous eruption, that broke into parallelograms on cooling, with a laminated structure parallel to it. Between the joints, and adhering to the sides of the wall, we found some deposits of gypsum and iron pyrites, and in the clay a cast of an inoccramus. We traced the wall on the surface of the ground, half a mile. Its direction is northwest and southeast. Two and a half miles southeast east of town, there is a second dike, or "wall," of the same thickness and material, which runs northeast and southwest, or at right angles with the first. This we examined from a well on Mr. Shaw's farm. A third dike, two and a half miles south of town, runs east and west. The character and position of the rocks in this are the same as those found in the first and second, except that they are only two inches thick. A fourth dike lies three miles south of town; this runs north of northwest and south of southeast. The character, thickness and position of the rocks of this dike are the same as those of the first and second. We traced the third and fourth dikes on the surface of the ground about two hundred yards. The surrounding country abounds with very high, bold hills. The third and fourth dikes are on the land of Dr. W. T. Barnes, to whom we are much indebted for valuable aid given us in making these examinations.

Rockwall is a small, but very rich county. I do not suppose there is an acre of poor land within its boundaries. The whole of it is prairie, consisting of a deep, black, waxy soil which is very productive. The best crops of corn, wheat, oats and cotton that I saw during the summer, were in this county. A brushy growth is found on the branches and creeks; the best quality of timber is on the

East Fork of the Trinity, and consists of ash, burr-oak, pin-oak, elm, walnut and bois d'arc.

July 17th.—We arrived at Dallas to-day, and met Dr. Buckley. He does not think the deposits of coal on Red River amount to much. He expected to have received money and arms at Dallas; but was disappointed. As this would occasion a delay of several days at this place, in which we would be in camp doing nothing for the survey, I decided, with Dr. Buckley's consent, and bearing my own expenses, to visit my family at Waco.

July 21st.—Returned to our camp at Dallas to-day. Dr. Buckley had no news yet from Austin, about money and arms, so we moved out six miles on the Fort Worth road, where we could get grass for our stock, and thus avoid what expense we could, while waiting for intelligence from the capital. We made some geological observations, and collected some specimens for the State cabinet.

July 29th.—Dr. Buckley received to-day from the Treasurer of the State, a check for $500, but received no arms. Adjutant General Steele sent him an order for arms on certain parties at Weatherford.

July 30th.—To-day we camped at Fossil Creek, in Tarrant county. This is a good place for collecting cretaceous fossils. We made quite a collection for the State cabinet, consisting of exogyra, ostrea, fasciolaria, inoccraneas, gryphea, scaphites, nautites, shark's teeth, and vertebræ of fish.

July 31st.—Camped to-day one mile west of Fort Worth, on the West Fork of Trinity, and spent the afternoon in collecting fossils. We found a very great number of clypeaster and ammonites.

Aug. 3d.—We reached Weatherford to-day, and found with much regret that we should be detained, and have trouble in getting up the arms scattered over Parker county. These were very necessary for us, as the Indians were threatening on the frontier, and it would be entirely unsafe for us to go there without being well armed. Collecting these detained us a week in Parker county, in which time I made what geological observations I was able, and gathered all the specimens I could for the State cabinet. This county is characterized by bold hills or mountains, which frequently rise to a great height from the level plain. They stand disconnected from each other, and have broad bases sloping to a narrow, flat top, which is covered with limestone rocks, gryphea, and exogyra. Mr. Joseph Jackson and I measured the height of two of these, one of which we found to be 83 feet, and the other 116 feet high.

Aug. 12th.—After very much trouble and more than a week's detention. we succeeded in collecting ten Winchester carbines in this county, belonging to the State. We now felt that, with caution, we could safely go any where we wished on the frontier. All were delighted at the prospect of visiting and examining the copper mines in the Wichita mountains; but, upon consultation, it was decided that we could not go to the mountains, and thence to Grayson county by the first of September; which time had been agreed upon for present active services with the survey to cease. Thus, most reluctantly, I had to give up, for the present, my long anticipated pleasure of examining the copper region of Texas. We took the direct route to Grayson, through Wise, Montague and Cook counties, camping for the night on the West Fork of Trinity, in Wise county. This is a new county, and is about equally divided, I should say, into timber and prairie land, which is rich and productive. The county is well watered and very healthy. It is being rapidly settled, and new improvements are to be seen in every direction. At Decatur, the county seat, we were shown some specimens of lead ore, which had been found in the county; it will run not less than 80, or perhaps 90 per cent. of pure lead. The parties who found it would not show us the locality where they obtained it, consequently we can say nothing of the quantity. I presume that it exists only in pockets of limited extent: I should not expect to find lead existing in large deposits in Wise county. Its elements of wealth are in the rich, black soil and salubrious climate. We camped for the night on Denton creek, twelve miles northeast of Decatur. This is a rich and most beautiful portion of the county.

Aug. 14th.—We travelled over high, rolling, rich prairies all day, and saw but little timber on our route. We camped on Spring creek, eight miles west of Gainesville. Upon this stream we found more and larger amonites than I ever saw before; some of them measuring two and a half feet in diameter.

August 15th.—We passed through Gainesville this morning, which is a beautiful, thriving little town. Cook is, in soil, one of the best counties in the State. The western portion of it is nearly all prairie, while the eastern is about equally divided between timber and prairie. The natural growth is mostly postoak, which grows to an unusually large size. In the eastern part of the county we found ferrugenous sandstone, brown hæmatite, and the very best quality of firestone I ever saw. Chimneys made of this stone have been exposed to hot fires for half a dozen winters, without the marks of the mason's hammer being effaced by the heat.

About sundown of this date, we arrived at Whitesboro, where Dr. W. H. Trolinger received and entertained us most kindly. He did every thing in his power to promote the interest of the survey. Dr. Buckley spent one day in making observations in the vicinity of Whitesboro, and found quite a number of interesting specimens belonging to the tertiary period, consisting of brown coal, iron ore, copperas and ostrea.

August 18th.—Dr. Buckley left me at Whitesboro today, with instructions to give the remainder of the time, till the first of September, to making further observations in Grayson county, around Sherman, and down the Texas Central Railway.

I parted with the Doctor and the young gentlemen of the State Geological Corps, with much regret. We had been pleasantly associated together, and our labors, I hope, will not be withouth benefit to the State. The Doctor spent neither pains nor labor to make the result of the survey interesting and useful to the people.

On this morning, at 11 o'clock, I took the stage for Sherman, at which place we arrived after a drive of four hours. Sherman is a thriving business town, of about six thousand inhabitants. With her enterprising citizens and railroad facilities, she has prospects of a bright future.

August 19th.—To-day, I went, with Mr. E. C. Ramage as guide, to examine an oil spring, which we found in a high bluff of the banks of Red River, fourteen miles northwest of Sherman, and one mile from the Rock Bluff, crossing on that river. At this spring, or sipe, the shellrock, so common in the northwest, I found overlying a soft sandstone; the former eighty feet thick, the latter twenty. The oil sipes from the crevices of the soft sandstone. The whole of the sandstone is saturated and dripping with oil. I followed the deep gorge down to where it spreads out into level ground, near the banks of the river. I found signs of a sandstone in the gorge, about one hundred yards below the first, which I believe, upon a more careful examination than I was able to make, will be found to exist. I carefully explored the banks of the river for several hundred yards, and found indications of oil at a dozen places, perhaps more. Parties living at the Bluff Rock crossing, told me, when the ground was full of water, oil sipes or springs ran from the bluffs on the Texas side of the river, every few yards, for three miles above and below the crossing. The strongest external indications exist of an immense fountain of oil in this neighborhood. I would not fail, however, to say that external indications are often deceptive in these matters, and I would advise parties not to rely on them wholly when investing their money. I would further advise that a shaft should not be sunk on the bluff above the main spring, where some parties have begun to bore; but at the mouth of the main gorge, on the level ground, near the river. I would regard the chances for piercing the main fountain much enhanced, by so doing.

August 20th.—I went to-day with some gentlemen of Sherman to examine a deposit of coal on Squirrel creek, in the neighborhood of Farmington. We found it in the dry channel of the creek, imbedded in a cretaceous formation. It is a thin stratum of very imperfect brown coal, three inches thick and eighteen inches wide. It amounts to nothing.

We traveled over some of the best prairie lands to-day that I have seen in Texas. This part of Grayson county is in a high state of cultivation. There were two flour mills in Farmington, which make as fine flour as is manufactured in St. Louis.

August 21st.—With Mr. F. B. Helwig as guide, I went to examine a deposit of iron ore, on Mr. Goode's land, lying twelve miles northeast of Sherman. The formation will cover an area of about five hundred acres. The ore is in irregular masses that will weigh from a few ounces to many tons each. It lies in a hill or mountain that varies in height from fifty to one hundred feet. There are three varieties of ore here; the gray ore, the brown and red hemætite, with a large portion of ockre. By a proper combination of these varieties of ore, I have no doubt the most superior Bessemer steel may be manufactured. From the large amount of ochre that is connected with the ore, it may be easily smelted, and will run about forty per cent. of metalic iron. The gray ore and the brown hæmatite lie on the south and west sides of the mountain, the red hæmatite on the north and east sides. The ore lies on and through a loose sand bed, consequently, quarring will cost but little. Underlying this vast bed of iron ore, is a stratum of shell limestone, twenty or thirty feet thick, from which any amount of flux may be made. Several bold chalybeate springs break out from the mountain sides, and Chocktaw creek washes the south and west base of the mountain. The mountain and valleys are covered with a dense forest of hickory and post-oak timber, from which charcoal may be obtained for half a century to come. The Transcontinental railway runs three miles south, and the Texas Central runs five miles west of the mountain.

Taking into consideration all the advantages immediately connected with and surrounding this deposit of iron ore, I am free to say, I do not know of more promising place in the State to build a foundry.

August 22d.—I spent the day looking for fossils in the vicinity of Sherman, and was successful in making a good collection, consisting of scaphites, ammonites, exogyra, ostrea, plicatula, inoceramus, vertibræ of fish and shark's teeth.

August 24th.—Left Sherman this morning at three o'clock on the train, and arrived at Wortham at eleven, where I was to make examination of a deposit of coal that had been reported to me. Afternoon, Mr. Ben Lombard, Sr., showed me two places on the prairie, about five hundred yards apart, where he had sunk shafts, from both of which he had obtained indications of a good quality of coal. Mr. Lombard is well acquainted with coal mining in Illinois, and he is confident of finding good coal in large quantities at this place. I hope he may. He has bought a league of land adjoining Wortham, and he has put a cotton gin and mill, which are among the many evidences of his enterprise and public spirit.

Late in the evening, I went to examine a coal deposit on Wolf creek, about one mile from the village. It was difficult for me to tell much about it with any degree of accuracy, the stratum being exposed only in the bottom of the creek bed. From an excavation that had been made in the coal, I guessed the stratum to be four feet thick, and about ten or twelve feet below the surface of the ground. It is a good quality of brown coal. Mr. Lombard says there are several other deposits in the neighborhood, where the strata are thicker and the quality better.

While looking for the coal deposit this evening, I found, in the high bank of Wolf creek, a bed of copperas. It is exposed for about fifty yards, and is, perhaps, six feet thick. It is very rich.

Wortham is on the line between the cretaceous and tertiary formations. The hills that bounded the western limits of the tertiary sea, are very prominent and well defined here. Tehuacana Hills, upon which the Trinity University is located, constitute a part of the same chain running northeast and southwest.

The State Geological Corps have traced the tertiary coal formations of Texas, from Bastrop, on the Colorado river, in a northeasterly direction, to a point on the Red River, twenty miles north of Paris. It lies in two strata, the first varying from ten to twenty, and the second from fifty to seventy feet below the surface of the ground. The strata vary from two to six feet each in thickness. The second stratum is always superior in quality to the first. Mr. Lombard says he has found a third stratum, which is superior to the second. We found the formation as far east as the Attoyar river, in San Augustine county, and presume it extends to the Sabine river.

Since arriving at home on the 26th of August, I have been anxious to make a short trip into Eastland and adjoining counties, to make an examination of the coal formation in that section of the State, but my duties in the Waco University, since the first of September, have been so constant and pressing that I have been, thus far, denied that pleasure.

The necessity for the trip has been, to some extent, obviated, by the fact that four wagon loads of coal, from that section, have been brought to Waco since the first of September. The first two were purchased by Mr. J. Winship for fuel to run the engine of his cotton-gin. It is a semi-bituminous coal, very much resembling that which I saw in the shops on the Texas Central Railway from Sherman to Corsicana, which had been shipped from the coal mines in the Indian Territory. The Texas coal had more sulphur and slate in it than had that from the Territory, which very much impairs its caloric value. The second two loads were brought from Stephens county, near the Clear Fork of the Brazos, and bought by Mr. A. S. Foster, an intelligent, practical blacksmith, who has had large experienced in working the different varieties of Pennsylvania, West

Virginia and East Tennessee coal, in the shops of Chattanooga. He says he is using the coal which was brought from Eastland county in his forge, and that it is equal to the best Pittsburg and West Virginia, and second only to the Cumberland Mountain coal. Mr. Foster has kindly furnished me, for the State cabinet, a specimen of this Texas coal, weighing eleven pounds. This also has a small portion of surplur and slate in it, but not enough to injure it materially. The parties who brought it to Waco told me they dug it from the bed of a creek, where it was covered with water and mud, and that they had excavated the stratum to a depth of seven feet without getting through it. The formation is about twenty feet below the surface of the ground, and three feet above the water line of the Brazos. If the outcrop, that has been subjected to the action of air and water, is as good as Mr. Foster thinks, doubtless the unexposed stratum will produce an article of coal equal to any in the world.

I have purposely avoided the use of technical terms as much as possible in my report, that it might be the more interesting to the general reader.

Respectfully submitted.

RICHARD BURLESON,
Asst. State Geologist.

APPENDIX.

REMARKS ON DR. ASA GRAY'S NOTES ON BUCKLEY'S NEW PLANTS OF TEXAS.

BY PROF. S. B. BUCKLEY.

In the spring of 1862, Dr. Asa Gray had two papers in the Proceedings of the Academy of Natural Sciences of Philadelphia, both of which were reviews of some new plants described by me in the same publication a few months previous. I left Philadelphia prior to the appearance of Dr. Gray's papers, being employed by the Sanitary Commission at Washington to make scientific examinations and measurements of Soldiers for anthropological purposes. *See Anthropological Investigations of American Soldiers, by Dr. Gould,* lately published by the Sanitary Commission. At the end of the war I returned to Texas, where I have been ever since. I did not see Dr. Gray's notes till August, 1867. I have few Botanical works here, and no Herbarium, and have delayed to notice some points in which I think Dr. Gray has not done me justice, in hopes to be able to have a better chance than I have here, but as time is passing I will offer what facts I have now, leaving others for another opportunity.

During 1859, '60 and '61, I made a large collection of rare plants, in Georgia, Alabama, Mississippi, Louisiana and Texas, which I had boxed and started with for the North, prior to the war. These were stopped and destroyed at Lavaca, Texas. They were intended for, and directed to, the Academy of Natural Sciences, of Philadelphia.

The few I saved I brought with me, but I found the Herbarium of the Academy not as complete as I supposed. I expected to find all the plants which Nuttall had described, as well as full collections of Wright and other botanists, who had explored Texas and other southwestern parts of our country. But these were not as full as I imagined and the Library was deficient in some works which would have aided me in my investigations. I appreciate these facts more fully now, than I did then, and can understand how very likely it is that I have made some mistakes. There are very few botanists who have not had to regret similar errors under similar circumstances. Indeed the object of this paper is to show that Dr. Gray himself has fallen into error in many particulars in the papers in which he criticises mine. For instance, *Clematis Texensis*, Buckley, Dr. Gray says in his "*C. viorna* var. *coccinea*, Pl. Wr. 2 p. 7, *C. coccinea*, Engelman." It is referred to *C. viorna* with the remark that its "leaves are more glaucous, and the thick sepals of a pure carmine red, very rarely purplish." I do not know that Engelman has ever *published* his name of *C. coccinea.* I believe all that has been published is in the extract quoted. If, therefore, it *is*, as I have no doubt the majority of botanists will agree with me that it is, a distinct species from *C. viorna*, my name has the right by priority of publication. It grows in the vicinity of Austin.

Zanthoxylum hirsutum Dr. Gray thinks but a variety of *Z. carolinianum.* There is a variety I know, and I suppose this is to what Dr. Gray refers. I am very familiar with it. It is abundant in the vicinity of Austin. But this is always small, the largest specimens with a trunk rarely exceeding three inches in diameter. This was a small tree, one foot at least in diameter, and atracted my particular attention by its very peculiar appearance, as I rode horseback in the vicinity of Corpus Christi. Its hairy leaves are a constant and distinctive character. I expect to get specimens again.

Ampelopsis heptaphylla Dr. Gray says is "a small leaved state of *A. quinquefolia* with *some* of the leaves 6–7 foliate." They are all, or *nearly all*, 7 foliate. If *A. quinquefolia* were known to be variable in respect of the number of leaflets on the same plant, there might be room to look for a variety with another number of leaflets. But this species is noted for the regularity with which it bears five leaflets only, both in the north and in the south. It grows in the same locality with my *A. heptaphylla*, constantly with five leaflets only. But this is not all; my plant not only has 7 leaflets almost constantly, but they are smaller than *A. quinquefolia*, and its flowers in *cymose panicles* at the *end of April;* while *A. quinquefolia* has compound racemes 3–4 inches in length, and does not open its flowers till the middle or end of June.

Vitis monticola, he says, is V. *rupestris* of Schule. In *Plantæ Lindh.* 2, p. 166, Dr. Gray himself says of *V. rupestris*, "It does not climb, but the stems are upright, and only two or three feet in height." This is right. I am familiar with it. But my *V. monticola does* climb, sometimes to the height of 15 feet. But in addition to this there is nearly *two months difference in the time of ripening of the fruit.* All the inhabitants of this region readily distinguish them as different things.

Vitis Lincecumii he refers to *V. labrusca*, and says that "the Louisiana specimen (of Dr. Hale) exactly agrees with what we formerly cultivated in Cambridge Bot. Garden as the Isabella grape." The Isabella grape is well known here, yet this is readily distinguished by the people of Texas, who call it the "Postoak grape." It has larger and less lobed leaves than the Isabella. The Isabella has naturally but one short bunch—this is shouldered or branching; the berries drop easily from the stems—these are strongly adherent; the skin is rather thick and the berries comparatively large,—while these are thin-skinned and smaller. The *V. labrusca* is a rampant species, this rarely grows 15 feet, and often bears fruit on bush like specimens, 3–4 feet high. I have studied both species very closely, both before and since Dr. Gray's criticisms, and can have no doubt of their distinctness.

Vitis mustangensis Dr Gray says "is not the mustang grape of Florida, but is the well known *V. candicans* of Engelman." He asserts further that *V. coriacea*, of Shuttleworth, is a thick-leaved form of it, the *V. caribæa* of Chapman, whether of DeCandolle I am still uncertain." I believe the only description of *V. candicans published* before my description of *V. mustangensis*, is the following from *Plant. Lindh.* 2, p. 166, where Dr. Gray says, "Under the name of *V. candicans* (N. S.) *Engel. ined.*, I have from Lindheimer, as also from Mr. Wright, Texan specimens of what appears to be a variety of *V. californica*, Benth., with the leaves somewhat less dentate, and more densely tomentose underneath." Again, in *Plantæ Wrightiana*, p. 32, in a note at the bottom of the page, he states, "*Vitis candicans*, *Engel. ined.*, which is also the *V. coriacea* of Shuttleworth, *Pl. Regel*, *ex. sic.* from southern Florida, is not the same as *Vitis californica*, Benth., to which I was disposed to refer it in *Pl. Lindh*, 2. p. 166. Perhaps it may be *V. caribœa* of D. C." If this is, as I believe, the only description of *V. candicans* ever published, is Dr. Gray justified in terming it "well known?" Surely Dr. Gray does not own to much acquaintance with it, and makes no allusion whatever to its native name "mustang."

Dr. Gray "warns the reader that mustang is not the name of a town or country, as the termination *ensis* would imply, but of a wild horse." I may add that it is *also* the name of a stream along which this grape grows in great abundance.

I saw Lindheimer at New Braunfels, in Texas, in 1860. He told me that Gray and Engelman, with whom he was in close correspondence, were both uncertain about this grape, and that it was still undescribed. He regarded it as "scientifically unnamed." Under the rules of priority of description, I claim my name.

It is unlikely that my mustang grape is the *V. coriacea* of Shuttleworth, for be it remembered I had traveled extensively in Florida, and should have seen this grape there if they had been the same, but I never saw it in Florida; but the greater probability of this is that Chapman, who had resided in Florida 25 years, describes no such grape as mine, but refers the *V. coriacea* of Shuttleworth to *V. caribœa*, D. C., and further says the mustang of Florida is a *form of V. vulpina*. See Flora of Southern States, p. 71.

Vitis bipinnata, with which name the authority of "Torr. & Gray" is associated, belongs really to Wildenow.

Astragalus Brazoensis, Dr. Gray has, on a second examination, done me the justice to declare a good species.

Hoopesia arborea I am charged with "making up from a flowering specimen of *Cercidum texanum*, Gray, a fruiting one of *Acacia flexicaulis*, Benth, and a sterile branchlet of *Acacia rigadula*, Benth." Of course, no one would suppose I would mix plants purposely with the object of making a genus or species. That no such a mixture was possible, I claim from the following facts. I was careful to select a large number of specimens with *both flowers and fruit on the same branches*. I also cut from sprouts which grew up from the base of the tree, so that I might have all its characteristics, for I felt then that it would prove to be undescribed. I spent a long time in getting these specimens. I was then engaged with Dr. Shumard in the geological survey of the State. Drs. Shumard and Riddell were then with me,—they in a buggy, I on horseback—at Corpus Christi together, and we started next day for Austin, my press and plants in the buggy. They went on hurriedly, agreeing to change my plants. I arrived in Austin in three days after them; and found my plants mostly spoiled. I saved only a few damaged specimens of *Hoopesia*. Familiar as I was with them in cutting, and again in my anxiety so few days after to select from the damaged specimens the best left, I do not see the possibility of any mistake; but intend to take the first opportunity to visit again the locality, and get specimens for the Academy and other public institutions. Trees of the *Hoopesia* grow on the banks of the Gulf, from one to two miles below Corpus Christi.

Drejera parviflora and *Morus microphylla* are admitted to be good species.

Juncus finipendulus has also, since Dr. Gray's criticisms, been decided by Dr. Engelman to be a good species. But he has changed the name, on the ground that my name is "inappropriate." My name was suggested by the thread-like hanging stems of its fruit and flowers. Even were the name less appropriate than it manifestly is, if botanists had a right to change names to accord with each compiler's sense of fitness, how many synonyms should we not have?

Juncus diffusissimus Dr. Gray says is *J. debilis*. Dr. Engelman has since decided Dr. Gray to be wrong in this, but I have not Dr. Engelman's monograph by me to refer to what he decides it to be.

Cyperus Heermanii is not referred to any other species, and

Eleocharis microformis, though said to be "near intermedia," is probably a good species also.

For want of books and material, as I have before remarked, I am unable to follow up these corrections further; but finding myself right in so many which I have been able to reconsider, I hope to be able to clear myself from some of the other charges in future.

Dr. Gray was particularly severe in his preliminary remarks. He accuses me of a "gross appropriation and suppression of the names of Nuttall and others, as recorded in a public herbarium." The laws of botanical nomenclature say "a name which has never been clearly defined in some *public journal or work*, shall be changed for the earliest name by which the object shall have thus been defined." See *Edinburg Philosophical Jour.*, 1863–4. Indeed, in the language of science, a plant has not been *named* until it has been *described* in some "journal or work." One may by courtesy adopt a name he finds on a label attached to a herbarium specimen; but if in his opinion, from the smallness or imperfection of the specimen, or from other reasons, he believes the interest of science would be served by the use of another name in his description, it is his duty to do so.

I feel that I have been wronged by Dr. Gray's personal remarks in his review of my papers. Considering such a course out of place in a scientific discussion, I have avoided anything like retaliation. But I have thought it due to me as the author, and the Academy as the publisher, of the papers criticised by Dr. Gray, that no more errors should be laid to their charge than they legitimately deserve.

Mines Metals & Arts
St. Louis Sep. 13/77

IRON ORES IN TEXAS—MAGNETITES.

When I was at the Centennial display at Philadelphia last year, I saw that the best iron ores (magnetites), in the Swedish department, were precisely similar to those of Llano county, in this State; so like, that massive specimens of the Swedish ores cannot be distingushed from those of Texas.

The magnetites in Llano county were first described in my preliminary report on the geological survey of Texas, 1866.

In 1875 I again examined the largest known locality of this ore, which is near Mr. Epperson's, about twelve miles northwest of the town of Llano. Here there are inexhaustible quantities of magnetite, forming two hills from 100 feet to 200 feet above the bed of a small creek—a constant flowing stream which runs into the Llano river. The ore also occurs in large veins of a width of from 3 to 5 feet in granite and granite rocks. I traced these veins several hundred feet across the stream.

Other large deposits and veins of magnetic iron ores are crossed by the road leading from the town of Llano to Packsaddle Mountain in the western part of the county; also large beds and veins of these ores are on the eastern side of said mountain, extending fifteen to twenty miles eastwardly across the Colorado river into Burnet county, along the valley of Hamilton Creek, and in the hills bordering it, nearly to the town of Burnet.

Westwardly from Llano county I have seen large beds and veins of these ores in Mason county, through the granitic region into Menard county, on the road from the town of Mason to Fort McKavett. This road goes over an iron hill a few miles, six or eight from the town of Mason.

These iron ores are in all probability of the same geological period in the older granitic rocks—a portion of these rocks

Cat.

SECOND ANNUAL REPORT

OF THE

GEOLOGICAL AND AGRICULTURAL SURVEY OF TEXAS,

—BY—

S. B. BUCKLEY, A. M., Ph. D.,

STATE GEOLOGIST.

HOUSTON:
A. C. GRAY, STATE PRINTER.
1876.

SECOND ANNUAL REPORT

OF THE

STATE GEOLOGIST.

To His Excellency, Richard Coke,
Governor of Texas:

This second annual report of the geological and agricultural survey of the State, is respectfully submitted to your consideration. With many thanks for the aid you have given the work,

I remain, yours truly,
S. B. BUCKLEY,
State Geologist.

INTRODUCTION.

In the following pages I have given what I deem to be the most useful things pertaining to the agricultural and mineral resources of the State, which I have obtained during the past year, reserving much geological matter of scientific interest for a final report. Since the last report, I have bought chemical apparatus sufficient to analyze mineral soils and mineral waters, which will be of great assistance in the future work of the survey. This apparatus has only been recently obtained.

AUSTIN, March 27th, 1876.

THE IMPORTANCE OF GEOLOGY AND GEOLOGICAL SURVEYS.

I supposed that the importance of geology and geological surveys was so well known and acknowleded that it would not be proper here to say anything about their usefulness. Nor should I allude to these things, had I not a few weeks ago, heard one who was called a leading member of the late Constitutional Convention, state in a public speech to that body, that "Geology is a humbug and he knew it to be so."

It is strange that all the leading universities, colleges and schools of the civilized world have been teaching a humbug for the last 45 years; and still more strange, that all civilized countries, including every one of the United States, excepting Florida, have had or are having geological surveys made of their domains; also, the United States Government, during the last 15 years or more, has had and still continues to have geological surveys made of its territories. These things have cost much toil and money. Has the labor been useless and the money wasted ?

Far from it. The States where these things have been done are the most prosperous and have the largest incomes in agriculture and manufactures of any in the world.

The State of New York in 1836 appropiated $104,000 for a geological and natural history survey of that State. In 1842 a further sum of $26,000 was appropriated, since which other sums have been appropriated for its geological and natural history survey, making the entire amount given for this purpose about $500,000. The first act for the survey was passed by its House of Representatives unanimously. Last year, 1875, $20,000 was appropriated for its State museum and geological survey.

The United Kingdom of Great Britain, with a territory at home less than that of Texas, has more productive wealth than all the cotton States. This arises from her superior agriculture and manufactures, joined with mineral wealth and sufficient intelligence to make the most of every natural advantage. Her mines are being developed at depths of from a few hundred to more than two thousand feet. In 1874, she appropriated 206,697 pounds sterling for the advancement of science and art, as follows: 102,442 to the British Museum, 17,862 to Kew

Gardens and Museum, 38,024 to South Kensington Museum, and 8,998 to the Geological Museum. I could give many more such examples of other prosperous States and nations.

Texas has more fertile soil, greater mineral resources and a better climate than England, all which gives promise of a rich and prosperous future, if her domain is rightly managed, by giving proper encouragement to her agriculture and manufactures and the development of her mineral wealth, now mostly hidden and unproductive.

Let the true condition of Texas be made known; capital will come here, intelligent, industrious people will also come, help bear our burdens, enrich themselves, and make us as a State richer.

A geological, agricultural and natural history survey of Texas will make her known abroad and give reliable information to many people in other Staes and countries, which are less favored by nature, having soils less fertile, climates less pleasant and less healthy, and also having less advantages for the easy accumulation of wealth and making pleasant homes.

SYNOPSIS OF WORK DONE FOR THE SURVEY IN 1875.

Continuing the plan adopted last year of ascertaining, by a general reconnoissance of the State, its main geological and agricultural features, our observations have been made mostly in the region west of the Colorado river and north of latitude 29 degrees.

Leaving Austin early in May, we went through the counties of Hays, Blanco, Llano, Burnet, San Saba, Mason, Menard, by way of Forts McKavit, Concho, Stockton, Davis and Quitman, to El Paso. Returning to Fort Davis, we went to Presidio del Norte, examined a portion of Presidio county; then back to Fort Davis, and via Stockton, down the west bank of the Pecos to a ford near old Fort Lancaster; thence down Devil's river via old Fort Hudson, San Felipe springs, Fort Clark, Uvalde, Castroville and San Antonio to Austin, where we arrived on the 27th of September.

We started with four teams and two young men on horseback. One of these teams belonged to Col. John M. Moore, a member of the last Legislature, from Corpus Christi. He is experienced in mining in Alabama, and also in the silver mines of old Mexico. He went as a volunteer, going as far as El Paso and back to Fort Davis with us, rendering valuable assistance. For the State collection we obtained many valuable specimens of minerals, fossils, etc., and also a large collection of dried plants for the botánical department, especially of western grasses.

We had been told that a small party could not safely go to El Paso on account of hostile, thieving Indians, who occasionally make raids into Texas from New Mexico and the Indian Reservation in order to steal horses and sometimes other stock, and also kill people. However, a small party of five or six men, well armed, can go over the route traveled by us with perfect safety. It is often done by two or three men. The El Paso stage has but one soldier as a guard. Wagon trains drawn by mules or oxen, conveying merchandise and supplies to the forts and people in the valley of the Rio Grande are going out west and back again, being almost constantly on the road. Small parties, for perfect safety, can join these. Roads of the route good and comparatively level.

GEOLOGY.

The following are the subdivisions of geological time now in general use in this country:

I. *Archean time*, including
    1. Azoic age.
    2. Eozoic age.
II. *Paleozoic time*, which includes
    1. Age of Invertebrates or Silurian.
    2. Age of Fishes or Devonian.
    3. Age of Coal Plants or Carboniferous.
III. *Mesozoic Time.*
    The Age of Reptiles.
IV. *Cenozoic Time.*
    Tertiary.
    Quaternary.

Our examinations during the past season have been of the—
    1. *Azoic age.*
    2. *Eozoic age.*

In the Paleozoric Time of the Lower Silurian and Carboniferous.

The Cretaceous of the Mesozoic Time. Lastly the *Tertiary and Quaternary.*

The Azoic age includes the granites and their associated rocks, destitute of fossils, viz: shales, mica schists, gneiss, hornblendes, porphyries, etc., which form most of the mountains in the western part of Burnet county, from which they extend westward through Llano and Mason counties beyond the town of Mason on the Menardville road, about eight miles. The southwestern boundary of these rocks is unknown, but is probably somewhere in Kimball county.

There are two or more periods of the upheaval of the granite in the region under consideration. In the eastern part of Llano county, at and near the Packsaddle mountain, are shales of laurentian age, uplifted at angles near the perpendicular, associated with and on the outer borders of the granite, which are overlaid by nearly or quite horizontal strata of the lower silurian (Potsdam) to the depth of several hundred feet. In other localities, at Marble Falls on the Colorado, and in Honey Creek cove in Llano county, the limestones and sand rocks of the silurian and carboniferous are uptilted by the underlying granite, at angles of from 25 degrees to 45 degrees and upwards. Still farther west, near Fredericksburg, horizontal strata of the cretaceous, and no other rocks but the cretaceous rest upon the granite.

AZOIC ROCKS WEST OF THE PECOS RIVER.

Fifteen or twenty miles beyond Leon springs, on the road from Fort Stockton to Fort Davis, and a few miles west of Barilla springs, is the eastern border of some azoic rocks, which extend westward to the Rio Grande and into Mexico. In going westward at Barilla springs, at the eastern boundary of the Limpia valley, and on each side of it, are rough and precipitous mountains of dolerite and basaltic rocks. Farther westward, in the Limpia cañon, the road is hemmed in on each side by nearly and sometimes perpendicular walls of these rocks, to the height of one thousand feet or more. A few miles to the east of Fort Davis they become feldspathic granites, with little or no mica, and such are most of the mountains around Fort Davis. Col. Andrews, commandant of the fort, told me that one of his officers had seen crystals of mica in that neighborhood, but I did not see any. This mineral is absent or but sparingly disseminated in all the western granites which came under our notice, with the exception of that east of Isleta.

About twenty miles west of Fort Davis, near the El Paso road, are several mountains of white quartz, so white that in the distance they resemble mountains covered with snow. Some of these are 7000 feet or more high.

At Muerto springs, westward a few miles further, quartoze and feldspathic veins are common, forming whitish lines up the sides of the mountains.

About thirty miles further west, at Van Horn's well, the prevailing rocks are dolerites and basalts, dark colored and massive. Twelve miles further west, are feldspathic granites intersected by large veins of quartz and feldspar of the orthoclase form. Hornblende rocks are also here. At Eagle springs, the mountains are similar as regards their rocks, to those at Fort Davis. Ten or twelve miles east of the Rio Grande, near the El Paso road, north side, one of the highest mountains is called Blanco, from its white appearance, caused by its quartz rocks. These mountains abound in quartoze veins. Twelve to fourteen miles east of Fort Quitman, is a group of mountains of igneous origin, which I did not visit.

About a mile above Hart's mill, on the Rio Grande, and four miles above El Paso, there is a mass of quartoze granite, the quartz placed so regularly as to resemble porphyry. This granite has a few small specks of mica, and is an excellent building rock. It rises but a few feet above high water mark on the river, and is overlaid by carboniferous and cretaceous rocks.

About thirty miles east of Isleta, is a group of granite mountains of two or three hundred acres area rising from 300 to 500 feet above the plain; these are called Cerro Hueco. These mountains are naked or nearly naked granite, and isolated from all other rocks. These granites contain but a small proportion of mica. From two to three miles further east, are the Sierra Alta mountains, of a height of more than 6000 feet composed mostly of limestones. On the western side and near the base of one of these mountains, there is a large dike of feldspathic granite, about forty feet thick dipping at an angle of about forty-five degrees beneath limestones of carboniferous age.

Going southward into Presidio county, below Fort Quitman on the south, to and in the vicinity of the Hot springs, there are many large dikes of basaltic rocks, some of which extend across the Rio Grande into Mexico.

The Chinati mountains, in the southwest part of Presidio county, are chiefly igneous rocks, granites, dolerites, etc.

On the road from Presidio to Fort Davis, about forty miles south of the latter, are low hills of dolerite and basaltic rocks.

All the igneous rocks that we saw north of the Pecos are either of upper cretaceous or tertiary age, shown by the uptilted strata of the cretaceous rocks amid and bordering the mountains. The Cerro Hueco mountains may be an exception. I saw no tertiary fossils beyond the Pecos.

OTHER BASALTIC ROCKS.

About four miles east of Fort Clark, in Kinney county, on the San Antonio road, are dolerite and basaltic rocks, extending fifteen to twenty rods along the road, and covering much of the hill over which the road passes.

Again, about two miles west of the Nueces, on the same road, there is a similar outcrop.

On the west bank of the Frio at the ford, there is a large mass of basaltic rocks about fifty feet high, extending several hundred feet up the river. On the eastward from the Frio, I saw dolerite rocks in the road and near it quite often. At one place, about four miles eastward from the river, there is a mass of dolerite covering several acres, surrounded by cretaceous limestones.

Again, Pilot Knob, about ten miles southwest of Austin, is dolerite, and here these rocks extend three or more miles, also surrounded by cretaceous limestones.

There are probably other localities of these rocks along the southern borders of the cretaceous region of the State.

LOWER SILURIAN.

The rocks of the lower silurian in Burnet and Llano counties have been noticed in previous reports. To define them correctly, a detailed survey is needed.

In the northwest part of Llano county, about two miles southwest of Smoothing Iron mountain, is a mountain with a sandstone base and limestone top, all of lower silurian; the sandstone below of the Potsdam period, the limestone above probably belongs to the Trenton period, indicated by shells of Orthis, Strophomina, Leptena and crinoids, specimens of which I collected last Spring.

The lower Potsdam sandstones have the peculiar green sand (glauconite), common to the rocks of the period in Burnet and Llano counties. The entire strata of the mountain has a thickness of about one thousand feet and all horizontal, most of the adjacent mountains being granite.

Sandstones of the Potsdam period abound in Mason county, and extend westward in Menard county, nearly to Menardville.

There is a fine exposure of these rocks in the western part of Mason county, on the Llano river, at the foot of Loyal valley.

Rocks which may and probably do belong to the lower silurian are upraised at the base of the Organ mountain at Fort Bliss, near the town of El Paso, where there is a fine display of uptilted strata of lower silurian, carboniferous and cretaceous rocks to a nearly perpendicular height of 1600 feet above the valley.

CARBONIFEROUS.

The rocks of this age in Burnet and Llano have been alluded to in former reports, and are noticed elsewhere under the head of coal.

CRETACEOUS.

These rocks have been traced the past season from a few miles west of Menardville to Fort McKavit, thence northward as far as Kickapoo springs, south of Fort Concho, again, from the Twin mountains, about six miles west of Fort Concho, westward to near Barilla springs, beyond Fort Stockton; thus far with no interruption by other rocks; thence westward to the Rio Grande. We saw no other sedimentary rocks except cretaceous, and only these at rare intervals, in uptilted strata among or on the sides of the granitic and basaltic mountains of that region. North of the Toyah valley are many limestone mountains which are probably of cretaceous age.

About four miles north of El Paso, above the Pass of the Rio Grande through the mountains from which the town of El Paso takes its name, are cretaceous rocks abounding in fossils. I was guided to them by the Rev. Dr. Tays, of Franklin. Here are ostreas, exogyras, grypheas, and many others of well known cretaceous forms, such as are common in the northern and central portions of the cretaceous formation of the State—gryphea pitcheri, and its large form var. Tucumcarii, this last quite common, as also is Exogyra Texana, Natica Pedernalis, Ostrea Marshii, and carinata, etc. In cretaceous mountains near Antelope springs, about fourteen miles northeast of Fort Stockton, I found Gryphea Pitcherii, Exogyra Texana, Inoceramus problematicus, Nautilus Dekayii, Heteraster Texanus, Cyphosonia Texana, Toxaster elegans. This last is quite common west of the Pecos, and so is Trigonia Texana, Amonites Texanus, and A. Leonensis, and others. In short, the fossils of the cretaceous west of the Pecos are many of them of the same species as those at Comanche Peak in Johnson county, and also in the cretaceous rocks in the neighborhood of Austin. Their lithological characters also are similar.

TERTIARY.

Early last spring we passed through Guadalupe and Caldwell counties, the sandstones and limestones of which belong to the older tertiary. These rocks are rarely seen, except in the beds of streams and on their banks. These counties are well watered by many streams, have plenty of timber for fencing, and fire wood, oak, elm, pecan, box alder, hackberry, mesquite, etc. Soil mostly a dark, rich sandy loam. These are two of the finest agricultural counties in the State—equal to the best, and now easy of access by the nearly completed railroad from the cities of Galveston and Houston to San Antonio. These counties are moderately undulating, low hills, broad valleys and rich prairies, skirted by woodlands.

QUARTERNARY.

The valley of the Rio Grande, from where the El Paso road strikes the river, about six miles below Fort Quitman, northward to El Paso, has two and sometimes three terraces. The two upper terraces are composed of sand and gravel, the gravel often filled with large quartoze water worn pebbles. This gravel has sometimes a thickness of one hundred feet or more, and a large portion of the distance extends back from the river fifteen or twenty miles to the mountains.

MINERALS—GOLD.

Near Muerto springs, eastward, near the head waters of the Limpia, are many quartz and quartoze veins. In one of these Mr. Delany, an employé at the Muerto stage station, says he got specimens of gold, of which he gave us some fine ones in quartz. He reports the gold to be abundant, but he refused to show us the locality unless we would give him $1000, and also buy the land and give him one-half interest in the property, to which we did not agree.

However, the indications in that region are such that probably both gold and silver will be found there.

Mr. Williams, agent of the Central Railroad, told me that he had seen gold panned out of the sand and gravel of ravines in paying quantities, near and at the lead and silver locality, fourteen miles east of Fort Quitman. A spring of good water is said to be near.

The Hon. C. R. Johns, of Austin, has lately shown me some specimens of gold ore, from rocks near the head waters of Little Llano, in Llano county. It is in quartoze and feldspatic (orthoclase) rocks.

ARGENTIFEROUS GALENA, OR SILVER AND LEAD ORES.

About fourteen miles eastwardly from Fort Quitman, on the western borders of the mountains, argentiferous galena is said to be abundant along a ravine. It is also said to be in veins. We saw numerous large specimens of the ore in the hands of different persons at Fort Quitman. Our specimens have but a small per cent. of silver, being nearly pure galena.

These ores also occur in a spur of the Organ mountains, about one mile north of Franklin, in El Paso county, at the old Padre mine, which is said to have been worked to the depth of about ninety feet. Here argentiferous galena was obtained, and the mine was worked for its silver. The vein filled a fissure of carboniferous limestone, which is overlaid by cretaceous limestones and sandstones a few hundred feet higher up the mountain. The strata are inclined at high angles, the upheaval having been made at or near the close of the cretaceous period. The dip is to the northwest of the mine, being but slightly inclined from the perpendicular. Iron ores, red hematites, which were dug out at or near the surface, lie around the entrance of the vein. Did not go into the mine, the wooden steps being much decayed, and did not get any good specimens of argentiferous galena from it.

In the valley, on the the northwest side of the mountain, about one mile distant from the Padre mine, is a vein of argentiferous galena from two to three feet thick, which seems very promising. It is in hard limestones, which contain large rhomboidal crystals of calcite. Here diggings to the depth of only two or three feet have been made, and good specimens obtained at several places, the vein extending one hundred or more feet.

The most promising mineral region I have seen in the State for rich ores of silver, lead and copper, is in and on the outskirts of the Chinati mountain, in Presidio county.

Mr. Williams, agent for the Central Railroad, in the location of lands, says that he has seen more than one hundred veins in different localities, of argentiferous galena and copper there. Iron ore also abounds. Accompanied by him, I visited that region and examined some of said veins. The Chinati mountains are from four thousand to five thousand feet high, in the southwestern part of Presidio county, the region examined being about twelve miles eastward from Mr. Spencer's, who has a large farm on the Rio Grande, twelve miles above Presidio.

The Spencer mine is in a ravine, near a fine spring, on the western base of the mountains. It, like all others seen by us in that region, is a *fissure vein*, extending across the ravine, exposing a width of ten feet and extends up the hills on both sides to an unknown distance. There diggings have been made to a depth of about three feet; not deep enough to see the dip or inclination of the vein.

About sixteen years ago, Mr. Spencer took several cart loads of surface ore from this vein into Mexico to be smelted. It gave $20.50 of silver to the ton. No account was taken of the lead. Since then great improvements have been made in smelting silver ores. I gave some of the ore from this locality to Mr. McCrary, of Omaha, who had it analyzed at Balbach's smelting works in that city, who reported it to be fifty per cent. lead and to give thirty ounces silver to the ton. At the request of Mr. Theodore Balbach, who now has charge of the Swansea Smelting Works, at Denver, Colorado, I sent him some of this ore, and also from other localities in Presidio county. In reply, he states that they all indicate that mining will be profitable in that portion of Texas.

Mr. Anderson, one of the proprietors of the Spencer mine, was with us in that region. His company own 640 acres, a section which includes the Spencer mine. His company had begun to erect works in Presidio for smelting ores.

Mr. Anderson gave me the following analysis of ores from different localities on the property of the company, made by Chauvenet and Blair, well known analytical chemists of St. Louis, Missouri:

			PER TON.
No. 1.	13 oz.	Coin value	$16 80
No. 7.	15 oz.	Coin value	19 30
No. 8.	59 oz.	Coin value	76 28
No. 9.	20 oz.	Coin value	25 85

All susceptible of much concentration, by which process they would yield a larger per cent. of silver. No bismuth or antimony in the ores. No account given of the lead, it being of little value in Presidio county.

Mr. Anderson, at another time, sent ores to the same chemists, who gave the following report:

		PER TON.
No. 1.	Silver	$144 80
No. 1.	Lead	34 25

This is a valuable ore, which can be made to yield a much larger per cent. of silver by lately improved methods of smelting.

A specimen of copper ore from a place about a mile from the Spencer mine, according to Chauvenet and Blair, has—

Siliceous matter	49.07
Peroxide of iron	14.65
Metalic copper	19.48

Silver, $2 58 per ton.

This is the carbonate of copper, an easy form for smelting.

To examine sufficient to make a good report upon the rocks and minerals of the southern portion of Presidio county, would require months of hard work. I was there but one week, and a rainy, cold, unpleasant week for us it was in the Chinati mountains.

I saw four large fissure veins of argentiferous galena, three of silver ore and two of copper, from all of which I selected specimens for the State cabinet. We intended to have visited many other places, but bad weather and limited time prevented. A part of the mines are on the six hundred and forty acres of the Anderson Company, and a portion on lands recently located by the Central Railroad. The course of the veins is not all in the same direction, nor are they all in the same plane with the strata of rocks, some being rents at nearly right angles to the trend of the line of upheaval, which is generally northeast and southwest. The veins are in cretaceous rocks, and are of the age of the upper cretaceous, or it may be the tertiary; fossils of the cretaceous period, being quite abundant *ostrea*, *exogyra*, *gryphea*, etc. Width of veins from two to ten feet, or more, only one being as small as two feet, this being argentiferous galena, and thought by Mr. Anderson to be one of the best. It is on the side of a mountain, whose upper portion is limestone, and the vein grows wider downward. Its name is the Anderson mine.

The silver, lead and copper mines of New Mexico, and those of Chihuahua in old Mexico, yield millions of dollars annually. The mineral region of El Paso and Presidio counties has the same geological formation of similar rocks, and probably will prove to be equally productive in the precious metals.

The gold and silver mines of Nevada and Colorado have given the most profitable results at depths of more than 1000 feet. The Consolidated Virginia, one of the most profitable mines in the world, has given a yield in bullion the past year of $16,731,653 43, besides having $478,080 of ore, as valued by assay, in the ore house and at the mills at the time the annual report of the superintendent was made; all taken at depths ranging from 1200 to 1500 feet, the yield from the ore averaging $98 per ton. Other mines at the west are now giving their best and most profitable yields of ore at depths nearly and more than 2000 feet. Mines which had proved unprofitable, and some even which had been abandoned, by going deeper furnish rich ores, and give high dividends to their stockholders. Immense bodies of ores called bonanzas were found at depths of more than 1500 feet, and the increased production of the last few years is chiefly owing to deep diggings. To show this increase, the following from Rossiter W. Raymond, United States Commissioner of Mining Statistics, is given, published last May in the Engineering and Mining Journal:

The total product of silver in the United States since 1848, is estimated as follows:

From 1848 to 1858, inclusive, $50,000 per annum	$550,000
1859	100,000
1860	150,000
1861	2,000,000
1862	4,500,000
1863	8,500,000
1864	11,000,000
1865	11,250,000
1866	10,000,000
1867	13,500,000
1868	12,000,000
1869	13,000,000
1870	16,000,000
1871	22,000,000
1872	25,750,000
1873	36,500,000
Total	$186,800,000

The same authority estimates the sum of the gold product of the United States, from 1847 to January 1, 1874, to be $1,240,750,000.

For the past two years, J. J. Valentine, General Superintendent of Wells, Fargo & Co., publishes the following:

STATEMENT OF PRODUCT OF PRECIOUS METALS WEST OF THE MISSOURI RIVER, FOR 1875.

States and Territories.	1875.	1874.
California	$17,753,151	$20,300,531
Nevada	40,478,369	35,422,223
Oregon	1,165,046	609,070
Washington	81,982	155,535
Idaho	1,554,902	1,880,004
Montana	3,573,609	3,439,498
Utah	5,687,494	5,911,278
Arizona	109,093	26,066
Colorado	6,299,817	4,191,405
Mexico	2,408,671	798,878
British Columbia	1,776,953	1,636,557
Total	$80,889,037	$74,401,055

In 1874, the Big Bonanza of the Nevada was discovered, at a depth of more than 1500 feet, where the amount of ore in sight has been estimated at from $60,000,000 to $1,500,000,000. To this is owing, in a great measure, the large yields of Nevada given in the above table.

I have given these statements of the value of the mining interests of the country for the encouragement of the mining industry of western Texas. Such veins as those of Presidio and El Paso counties rarely become poorer on going deeper.

SILVER IN MASON COUNTY.

About five miles northeast of the town of Mason are some silver mines, which, at the time of our visit, about the first of last June, were being worked by Messrs. Thompson, Wood & Morrill. Vein at top, twelve to fourteen inches thick; at the depth of forty-two feet, its thickness is nine feet. It is mostly calcite, dipping at an angle of about forty-five degrees. Its upper wall is a layer of mica schist, about sixteen feet thick, quartoze granite beyond and also below the vein. The silver is in small grains, disseminated in gray limestone. Mr. Thompson told me that he had obtained specimens which assayed $300 to the ton. Those which I saw will give a much less yield.

In the eastern part of Mason county, on land belonging to C. R. Johns & Co., are said to be large veins of silver ore. Specimens of this ore I have seen which assay from $14 to $16 to the ton. The gangue is granular epidote in a quartoze rock, through a portion of which is scattered the granular silver.

I have a small specimen of copper and silver ore from a vein said to be two feet thick, which has been traced to the distance of three miles or more. So says Dr. C. S. Smith, of the town of Llano, through which the vein is said to extend. This specimen has a large per cent. of silver and also of copper. If enough of such ore is there, it will be very valuable, and give a new impetus to mining in Llano county. I am indebted to Dr. Smith for these and other valuable specimens. The vein is in the metamorphic rock of mica schist in the granitic region.

In the western part of Burnet county, about three miles from the town of Bluffton, are lead ores (galena) in the sandrocks of the Potsdam period. We visited this place last spring. A shaft has been sunk to about twenty feet, and the mine abandoned, the ore being scattered through the rocks and no regular veins; indication unfavorable.

The following list, from the Mining Review, of Denver, of June 10, 1876, embraces nearly all the shafts in the West, that have been sunk to a depth of 500 feet and over, on veins worked mainly for the precious metals:

State or Territory.	Place.	Metal.	Name of Mine.	Depth
California.	Grass Valley	Gold	Empire	1400
do	do	do	North Star	1300
do	do	do	Eureka	1300
do	do	do	Idaho	1200
do	Bear Valley	do	Pine Tree	1100
do	do	do	Princeton	900
do	Grass Valley	do	N. Y. Hill	800
do	Amador co	do	Consol. Amador	900
do	Silver Mt	do	Pennsylvania	800
do	Bear Valley	do	Josephine	700
do	Amador co	do	Mahoney	700
do	El Dorado co	do	St. Lawrence	500
do	Deer Creek	do	Providence	500
Nevada	Virginia City	Silver	Hale & Norcross	2200
do	do	do	Imperial Empire	2200
do	do	do	Savage	2000
do	do	do	Best & Belcher	1800
do	do	do	Gould & Curry	1750
do	do	do	Bullion	1700
do	do	do	Crown Point	1700
do	do	do	Belcher	1600
do	do	do	Julia	1600
do	do	do	Consol. Virginia	1600
do	do	do	Ophir	1600
do	do	do	California	1600
do	Pioche	do	Meadow Valley	1350
do	do	do	Raymond & Ely	1300
do	Eureka	do	Richmond Consol	1200
do	do	do	Eureka "	1100
do	do	do	K. K. "	900

State or Territory.	Place.	Metal.	Name of Mine.	Depth.
Nevada	Virginia	Silver	Justice	900
do.	do.	do.	New York	900
do.	Eureka	do.	Ruby Consol	800
do.	Belmont	do.	Eldorado	500
do.	Virginia	do.	Lady Washington	530
Idaho	Owyhee	Gold	Ida Elenore	1040
do.	do.	do.	Mahogany	920
do.	do.	do.	Golden Chariot	910
do.	do.	do.	War Eagle	840
do.	do.	do.	Minnesota	800
do.	do.	do.	Empire	600
Utah	Ophir	Silver	Chicago	1200
do.	Dry Cañon	do.	Hidden Treasure	1100
do.	Cottonwood	do.	Flagstaff	900
do.	Dry Cañon	do.	Flavilla	700
do.	Cottonwood	do.	Vallejo	600
do.	do.	do.	Emma	500
do.	Parley's Park	do.	Ontario	500
do.	Bingham	do.	Winnamuck	500
do.	do.	do.	Neptune & Kempton	500
Colorado	Central	Gold	Burroughs	850
do.	do.	do.	Briggs	600
do.	do.	do.	Gunnell	600
do.	Caribou	Silver	Caribou	540
do.	Central	Gold	Leavitt	530
do.	Georgetown	Silver	Dives	500
do.	do.	do.	Terrible	500

COPPER IN PRESIDIO COUNTY.

This has been noticed under the head of silver and lead ores of that region. I saw at three different places in the silver region of the Chinati mountains veins of copper associated with iron of a width of from ten to twenty feet. This was at one place visited in company with Colonel Anderson. Here there are several fissure veins of widths as above named. The deposits of iron and copper are immense; an analysis of this surface ore is given elsewhere under silver. Another outcrop of similar copper ore at the top of a hill is about six feet wide extending along the surface one hundred or more feet.

Several persons who had seen it told me of a copper vein about thirty miles below the Hot springs, which is said to extend across the Rio Grande. I have seen specimens of this ore, which is a malachite or green carbonate of good quality.

COPPER IN MASON COUNTY.

About two and a half miles northwest of the town of Mason, near the Menardville road, there is a vein of copper near the bottom of a ravine; its width is little more than six feet in feldspathic and quartoze rocks. The best surface specimens of this ore yield about ten per cent. of copper; its appearance is promising.

Near the head waters of the Little Llano are copper veins of similar quality in similar rocks.

PYROLUSITE.

There is a vein nearly ten feet thick of this mineral near the top of a mountain in the eastern part of Mason county, at a place called the Spiller mine, from which about thirty tons of ore were sent abroad last spring to be smelted, it being reported to be very rich silver ore. The assay and smelting showed that it had not enough silver to pay for working.

TOURMALINES,

Of black, brown and white colors are quite common in several parts of Llano county, in granite regions.

GARNETS.

In the mica schistoze rocks near the Sandys in the middle and southern part of the same county.

AMETHYSTS.

In the granite regions of Burnet and Llano counties.

MOLYBDENA.

In Burnet and Llano in thin layers in gneissoid rocks.

ASBESTOS.

Near the Sandys, in the neighbornood of Enchanted rock, not seen in sufficient abundance to be of commercial value.

STEATITE OR SOAP STONE,

In large veins of massive form and light gray color, is on the Hondo, a branch of the Sandy and also on the Sandys, in the mountains about midway of its course through Llano county. The various uses of this mineral are well known. Inexhaustible quantities of it are in Llano county.

OBSIDIAN.

About six miles distant westward from Muerto springs in Presidio county, along the valley range of mountains, not from the El Paso road, are large massive veins of obsidian.

JASPER.

Large masses of green and red jasper are near the Barilla spring. They are probably altered sandstones of cretaceous age, being near the base of mountains of igneous origin; I also saw red jaspers among the mountains near Fort Davis.

OPALS.

Common opals of good quality are quite abundant near Van Horn's well, also sparingly scattered among the igneous rocks of the west.

PHRENITES

Are quite abundant associated with opals.

AGATES,

Of both the moss and common kinds, are in the same region; also carnelian and chalcydony, which, when united, form agates.

We collected good specimens of all these and others for the State collection.

SALT.

Abounds in the country along the upper Pecos above the road from Fort Concho to Fort Stockton,

Near the Horse Head crossing of the Pecos are large deposits of salt in the bed of what is called Salt Lake. To this place wagons resort for supplies of salt for El Paso, Presidio and other counties.

BITUMINOUS COAL.

In Llano county, in Honey Creek cove, at a place visited by me last year, with Dr. C. S. Smith, of Llano, there is a bed of bituminous coal, about two feet thick, of excellent quality; the bed has been traced along the side of the hill to the distance of about twenty-five feet; so says Dr. Smith, who has opened the mine to the extent of only a few feet. In the State collection, there is a specimen of this coal weighing forty pounds. Dr. S. thinks that lower down there is a larger bed, and this is probable. This is on the carboniferous.

In the northeastern portion of Concho county and southwestern part of Coleman county, not far from the Colorado river, there is a large bed of bituminous coal, which is about three feet thick. This coal is of good quality and is used by the blacksmiths, at Fort Concho, and at Ben Ficklin, in Tom Green county. These coal beds are said to be very extensive and good coal abundant.

In Presidio del Norte we were shown samples of coal of very good quality, which were said to have been obtained from a bed cropping out to a considerable distance, four feet thick. This is sixty miles below Presidio del Norte, on the east of the Rio Grande, twenty to twenty-five miles back from the river. The bed is in loose slate and sandrocks. It had recently been visited by a party sent by the Central Railroad Company, and a mining company, located at Presidio. Thus placed, in a region abounding in rich ores of silver, lead and copper, it is very valuable.

CANNEL COAL.

In Kinney county, on the Nueces river, about twelve miles below the road from San Felipe to San Antonio, are several beds of this coal, from three to four feet thick, as reported by Col. John M. Moore and others. I have seen specimens of the coal, which is of a very good quality.

The carboniferous formation extends northward from Llano county to the Red River in Wichita county, throughout which, in various places, coal crops out. Some of these places are noted in my last report. But as yet only diggings near the surface have been made. Deeper, larger beds and better coal may be, and probably will be found.

From recent experiments made to ascertain the comparative value of the bituminous coal of Cumberland, Maryland, and the anthracites of Pennsylvania, we learn that for steam raising power the bituminous coal is the best by from ten to fifteen per cent. A notice of these experiments appeared about a year since in the Coal Trade Journal. They were made by fifteen or more customers (living in different parts of the country) of Messrs. Stevenson & Pierson, large coal dealers of Boston, and at the suggestion of Messrs. S. & P.

Anthracite has long been considered as the best coal for almost every purpose, but these experiments prove that it is not.

TEXAS LIGNITES OR BROWN COALS.

Since my last report, I have been informed by letters that the brown coals or lignites of Robertson county have recently been used as fuels at Dallas and elsewhere, and given general satisfaction.

The proprietor of the hotel, Mr. Nicholson, at Bastrop in Bastrop county, lately told me that during the last three years he had used the Bastrop coal (lignite) as fuel for cooking and warming the hotel rooms, and found the coal cheaper and better than wood, and wood is abundant in Bastrop county near the town.

The composition of the Texas lignites does not differ materially from the lignites of the Pacific and Rocky mountain States, generally leaving from forty to fifty per cent. of fixed carbon. The western lignites are extensively used for generating steam, and as fuels in dwellings, and there is no doubt but that those of Texas can be used for the same purposes.

The great drawback upon the commercial value of the lignites is, that they will not coke by the ordinary process of coking. It is said that successful experiments have lately been made in coking lignites, and if this be so, the value of those of Texas will be greatly enhanced. The following, in relation to the subject, is from a late number of Ware's Journal of "*Mines, Metals and Arts,*" of St. Louis:

COKING LIGNITES.

Mr. W. J. Lynd, of Denver, after successfully experimenting, has devised a method of treatment by which he makes a serviceable coke, which is said to be very well adapted to furnace and other uses. It is even claimed that this fossil coal coke is comparable with Connellsville coke, which we could hardly expect, from the larger quantity of ashes in the lignite coal. Mr. Lynd has secured two patents. We give the following extracts from the description, wherein he says:

"That it may be more clearly known what are the coals understood by certain fossil coals, I specifically designate as such the coals found in the territories of Colorado, Wyoming, Utah, and New Mexico, and all similar coals wherever found in the United States. Some of these coals are at present mined near Cañon City, in Fremont county, at or near Trinidad, and elsewhere in Colorado territory, at Rock Springs and elsewhere in Wyoming territory; at Evanston and elsewhere in Utah territory; at Coos Bay and elsewhere in Oregon territory; at Bellingham Bay and elsewhere in Washington territory; at Monte Diablo and elsewhere in California. These fossil beds are reported by geologists to be of the eocene formation. In the geological survey of Ohio, vol. 1, page 83, is the following statement: 'It should also be mentioned that in North America the cretaceous was a great coal making period, as rocks of this age in the far west contain, at various points, important beds of lignite, some of which are from thirty to fifty feet in thickness. The coals of Vancouver's Island, Bellingham Bay, Monte Diablo, those of New Mexico and Arizona, as well as some of the most valuable beds in Utah, Colorado and Wyoming, are of cretaceous age. These, with some tertiary lignites, comprises all the so-called coals of the far west.' In Professor Hayden's report of 1870, page 186, is the report of the Omaha Gas Company: 'Residue, after coking in retort, twelve bushels of earthy breeze in small cubes, which, when put in the furnace fires, smothered them. The coke is worthless for heating purposes. Coal from Rock Springs, Wyoming, was also treated, and is also precisely similar.' These coals are commonly called and recognized as lignites; yet, as other names are given I prefer to denominate them as fossil coals, and to specify localities at which some of them are found and mined, that they may be definitely known. From these coals I make a serviceable coke, useful for all heating purposes. I coke them on a principle founded on the admitted fact that no fossil coals contain bitumen is formed. These constituents are hydrogen and carbon, and sometimes oxygen combined with them.

In carrying out my invention I use coal, either in the slack or finely pulverized state; but I prefer to use the powdered coal. I have discovered that the more finely powdered coal is better adapted by these processes for making good coke. When the coke is finely powdered, and the heat is properly applied thereto, as hereinafter described, the constituents of bitumen will be more readily disengaged, and will combine so as to draw the particles of the coal and make them cohere, and form a uniform, compact, dense coke.

Another process is mainly applicable to coals in the lump, and by it such coals can be thoroughly coked without disintegration or losing their original form. This is a feature with most of the varieties of the lignites, which, when in the condition of slack, or when once disintegrated, cannot, by ordinary processes, be again caused to cohere and coke."

Dr. Lynd in practicing his system of coking does not confine himself to any one kind of apparatus, the sole purpose of the invention being to make a good merchantable coke from the lignites that so abound in the West. Dr. L. claims that any of these lignites can by his method, be converted in good coke. If the doctor does not claim too much for his invention as to percentage of coke and other minor points, this invention will prove of immense importance to the smelting industry of the West. We have not yet seen a specimen of the coke.

FELDSPAR AND PORCELAIN CLAYS.

In Llano county, near the base of Packsaddle mountain, easterly, are large beds of feldspar, from two to four feet thick.

Extensive beds of the same variety of feldspar (orthoclase) are near the Anderson Copper Mine, in the Chinati mountains, in the southeastern part of Presidio county. There the beds are from 20 to 50 feet thick, inclined at an angle of about forty-five degrees, and of a yellowish white color.

These feldspars can be utilized in the manufacture of the finer porcelain.

Porcelain clays, suitable for making common wares, prevail in Concho and Tom Green counties, and westward to the Rio Grande.

SLATE—ROOFING.

Near the base of Packsaddle mountain, on the banks of Honey creek, are large beds of bluish black slates, of a jointed and thinly stratified structure, in beds inclined at high angles. These slates resemble the surface slates of New Hampshire and Vermont, which lead lower down to quarries of good roofing slates.

It may be that those of Llano county, when quarried to the depth of a few feet, may afford a good material for roofing. Mr. Williams, who has recently been locating lands in Presidio county for the Central Railroad, assures me that extensive beds of good roofing slate are in the Chinati mountains of that county.

These slates are on section 3d of the Central Railroad survey. Strata about one hundred feet thick and dip southward.

GYPSUM

We saw disseminated in the shales and clays bordering the Rio Grande, between Fort Quitman and the Hot springs. We were told by the United States officers and others that gypsum abounds in the eastern part of El Paso county, the northern portion of Presidio county, and also in the northern part of Bexar Territory. These deposits, with those in the Pan Handle, on the waters of the sources of the Red River, show that Texas has enough of this valuable mineral for fertilizing and other purposes.

Besides its well known use as a fertilizer, it is used for stucco work, for casts, etc. Under the name of plaster of

Paris, it is used for plastering walls for a hard finish. Within a few years, gypsum burnt with alum, called alumed plaster, has been used in the arts. It is harder and more beautiful than common plaster, and like some alabasters, has considerable transparency.

It is thus prepared: After the plaster is burnt, it is immediately saturated with alum water; after having been wet for about six hours, the water is poured off, the plaster dried in the sun and again burnt. It is then used like common plaster, but moistened with a solution of alum instead of water. Mixed with half sand, it acquires great hardness.

According to the last census there were three hundred and twenty-one mills in the United States for grinding gypsum, and the value of the product amounts to $2,500,000. Most of this is used in the States east of the Mississippi river and north of the cotton States for improving the soil and crops.

There is no doubt but that Texas has vast wealth in her gypsum now lying dormant for want of cheap transportation. When railroads extend to the gypsum region, this wealth will begin to be realized. At present Texas imports most of the gypsum used in the arts and for finishing the walls of buildings.

For further notice of iron ores, see manufactures.

METEORIC IRON.

In the State collection is a specimen of this weighing three hundred and fifteen pounds. It is said to have been found on the head waters of the Red River, northward of Young county. It was an object of worship or veneration to the Indians, who revered it as foreign to the earth and coming from the Great Spirit. In 1858 or '59 Maj. Neighbors, then in command at Fort Belknap, sent a wagon after the meteorite and had it brought into the fort. It was thence sent in a government wagon to San Antonio and onward to Austin.

Various have been the conjectures as to the origin of metorites, some asserting that they came from volcanoes in the moon, having been thrown beyond her centre of gravity, but few if any now believe this. Others think they are fragments of a broken planet, and others think that they belong to a large class of meteors flying through space, which occasionally happen to light upon the earth.

One thing is certain, they come from the space beyond the earth. This we know, because they have been seen to fall. Meteoric iron usually has a small per cent of nickel, cobalt, manganese, copper and tin. It is malleable, exceedingly tough, and may be used like manufactured iron. Our meteorite has a strong resemblance to one in Yale College cabinet, weighing 1635 pounds, which also came from the Red River of Texas.

MINING RIGHTS.

I have been asked what is the law in regard to mining tunnels.

The law confers a right to the owners of the tunnel to all ores on the line of the tunnel and of the width of the tunnel within three hundred feet of its face; provided there are no veins or indications of ore belonging to other parties above the line of said tunnel, which did belong to said parties before the commencement of the tunnel.

Such seems to be the meaning of the "Tunnel Act" of Congress, 1872.

HOT SPRINGS.

These are in Presidio county, about a quarter of a mile from the Rio Grande, about thirty miles below Fort Quitman, amid rugged mountains. To get there, we went on horseback by a dim path, up and down mountains, guided by a Mexican.

The springs seem to have originally been a pond or lake of an area of about twelve acres, which has been gradually filled up by depositions of siliceous matter, strongly impregnated with soda, magnesia, etc., of a granular texture, so hard as to be broken with difficulty. It has a mottled color of dark gray and bluish black. The rocks of the outer rim of the area are similar to those now being made by depositions from the springs.

There are two springs, about one hundred and thirty feet apart, each about ten feet in diameter, inclosed in a circular rim about three feet high; water clear and of an unknown depth, attempts to sound them with a line nearly one hundred feet long have failed. Gasses are continually ascending to the surface, which keep the water in continual agitation; water strongly impregnated with salt, soda and magnesia; temperature of one, one hundred and ten degrees, and the other ninety-four degrees. They are three thousand two hundred and sixty feet above the sea.

Southwest of there, in Mexico, at no great distance, are hot springs, hot enough to boil an egg or blister the hand. So said Mr. Russell, an American merchant of Presidio, who has lately visited these springs.

These springs, both Texan and Mexican, are in a region of igneous rocks, of dolerite and trappean form. Large dikes of these are in the limestones near and in the vicinity of the springs.

MASTODON AND ELEPHANT.

Bones of the mastodon and elephant have been found in nearly every part of the State, showing that these huge animals were quite numerous in the olden time, say a few thousand years ago, when man was also living.

Bones of the ancient elephant were found recently in digging a cellar at Austin, at the depth of five or six feet in a dirt bed, where it would not be strange to find the bones of man. The teeth show that it was the ancient elephant (*elephas primagenius*), different from the one now living.

PAINTED ROCKS AND CAVES.

At the Cerro Hueco, or Waco Tanks, about thirty miles a little north of east from Isleta, are painted rocks and caves. The Cerro Hueco is a small group of granite mountains, abounding in caves and precipices. Some rocks have perpendicular faces from three hundred to four hundred feet high, and one, Blanchard's Tower, has a height of more than five hundred feet above the plain. On the perpendicular sides of some of these, and in cave-like hollows beneath overhanging rocks, are numerous rude paintings of men, women, and various animals, including birds and serpents. In one place there is a conspicuous figure of the sun facing the east and sending forth his rays. The paintings were made with red, blue, black and white paints, with little or no regard to perspective.

Mr. Blanchard, of Isleta, who accompanied us, stated that about sixteen miles southeast of this locality there also are similar paintings in an excellent state of preservation on rocks. At a place called Painted Caves, near the lower crossing of the Devil's river, are also a few paintings of a similar character.

ANCIENT SHELL BANKS.

Mr. Triplett and Judge Pickett, late members of the Legislature, inform me that there are numerous artificial shell mounds along the coast, thirty to fifty miles inland in the southeastern part of the State. Charcoal beds where fires were made are also there at and near the surface.

In the State collection is a vase about fourteen inches high and eight in diameter at the top. It is of dark brown pottery, and has some rude carvings or marks on the outside. It was found beneath a ledge of rocks by Mr. Wm. Ditto, near Graham in Young county. It had been slightly covered with earth, and some animal had dug and partly uncovered it.

HEIGHTS ABOVE THE SEA.

The following measurements of heights were made with one of Green's improved and compensated aneroid barometers of late date (1875), and may be relied upon as being nearly true:

The country west of Fort Concho is higher than is generally supposed, and its mountains are higher, the highest probably being in the neighborhood of Fort Davis and at the head of the Limpia, on whose waters the fort is situated, at the base of some precipitous mountains, at an elevation of about five thousand feet. Ten or twelve miles west of the fort, near the El Paso road, is what is generally supposed to be the highest mountain in that region, a mountain which is a prominent feature in the landscape, being seen from long distances. It being unnamed and its height unknown, I went to its top and found it to be seven thousand four hundred and fifty feet high, it being the highest point which I have visited in the State and several hundred feet higher than any mountain in the States east of the Mississippi river. I have named it in honor of Richard Coke, our present worthy Governor.

Farther west there is another prominent mountain, the highest at Eagle springs. This is six thousand five hundred and fifty feet high. It has been supposed by many to be higher than the preceding, because it has been looked up to from a much lower plain. This is Moore's peak, in honor of Col. Jno. M. Moore, of Corpus Christi, who accompanied me in most of the trip, rendering essential assistance.

The Staked Plain extends southward from the northern part of the State, to near the northern bounderies of Medina, Uvalde and Kinney counties, northeast of San Antonio. In its southern portion it had a height of about one thousand feet. At the far north it is often five thousand or more feet high. On the El Paso stage road, west of Fort Concho, its highest portions east of the Pecos are about three thousand feet. West of the Pecos, at Fort Stockton, it is three thousand feet high. On the road from Fort Stockton to Fort Davis, its limestones are seen a few miles west of Leon springs, at an elevation of a little more than three thousand feet; thence it trends westward and northwestward, being the northern boundary of the Toyah valley, and also of the valley of Eagle springs, being readily distinguished by its flat topped limestone mountains of the cretaceous period.

It is not now all a plain, as it once was long, long ago. That it was all plain is proven by its nearly horizontal strata, so like in appearance and thickness throughout the entire region, as to prove that the whole was once continuous and unbroken. Now it is intersected by rivers and valleys, the largest river and valley being that of the Pecos. Viewed from the top of many of its mountains, it presents the appearance of a vast plain, with here and there a mesa or table, a few feet higher than the rest.

For the convenience of reference, the following table of heights along the route are given:

Austin	500	feet.
Highest portions of Hays and Blanco counties	100 to 1500	“
Bluffton, in the eastern part of Llano county	1250	“
Highest mountains in the eastern part of Llano and the western part of Burnet counties	2000	“
Smoothing Iron mountain, in the northwestern part of Llano county	2343	“
Camp near its base	1800	“
Highest mountain near Spiller mine, in the eastern part of Mason county	2350	“
Spiller mine	2000	“

Old Fort San Saba, Menard county	2100	feet.
Mountains near fort	2300	“
Fort McKavit	2040	“
Fort Concho	1825	“
Twin mountains	2200	“
Height of first stage station on the Concho, west of Ben Ficklin, in Tom Green county	2125	“
Second station, at head of Concho	2450	“
Mustang Holes, fifteen miles of the head of Concho	2525	“
Height of camp about three miles west of Centralia	2625	“
Plain between there and Pecos	2700	“
Pecos, near stage stand and bridge	2100	“
Escondido spring	2230	“
Fort Stockton	3000	“
Leon springs	3050	“
Camp at Barilla springs	3680	“
Fort Davis	5000	“
Mount Coke	7450	“
Point of rocks west of Fort twelve miles	1600	“
Muerto springs	5150	“
Highest point on the El Paso road, on the west end of Skillmas grove, about fifteen miles west of Fort Davis	5950	“
San Salomon springs, at the head of the Toyah	3250	“
Crows Nest, between Fort Davis and Muerto	5800	“
Van Horn's mill	4000	“
Eagle springs	4600	“
Moore's peak	6550	“
Fort Quitman	3500	“
San Signacio	3600	“
San Elizaria	3675	“
Isleta	3700	“
Franklin	3740	“
Hot springs	3260	“
Presidio del Norte	2200	“
Flat Topped mountains, near old Fort Lancaster	2400 to 2500	“
Cedar brakes, Bexar territory	2500	“
Johnson run	1800	“
High Prairie South	2000	“
Head of Devil's river	1650	“
Camp on “ “	1600	“

Hills above valley	300 to 400	feet.
Yellow banks	7250	"
Painted caves	900	"
Crossing of Devil's river	850	"
Prairie South, on road, highest points	110 to 1200	"
San Felipe spring	900	"
Mud creek	1100	"
Fort Clark	1200	"
Nueces	860	"
Uvalde	850	"
Castroville	630	"
San Antonio	550	"
New Braunfels	565	"
Mountain City, Hays county	900	"

HYDRAULIC CEMENT.

There are many impure limestones in Texas which can be made into hydraulic cements of more or less efficiency. Argillaceous limestones yield hydraulic lime immediately on burning. Such limestones must contain at least from ten to twelve per cent. of clay. Cements made from such rocks require about twenty days to harden under water or in moist places. Cements made from limerocks having twenty or twenty-five per cent. of clay set in two or three days; and those having thirty per cent. harden in a few hours. This last form of lime is sometimes called Roman cement.

However, every neighborhood which has good limerock and clay has all the elements necessary to make a good hydraulic cement. These artificial cements are now extensively made in Europe and America.

Artificial hydraulic limes were used in a majority of the buildings in Paris, France, where hydraulic lime is made by using four parts of chalk and one part of clay, all from Mendon, a few miles from the city. The clay and chalk are ground by large wheels revolving in a circular track, made into a paste and formed into bricks, which are dried in the sun, and burnt like hydraulic limestones.

The burning of hydraulic limestone requires peculiar care, because, if the temperature be too great, the silex of the clay is melted, and forms a too close combination with the lime, and then it will not form a new compound and make a good cement by the addition of water; hence, the heat should only be sufficient to expel the carbonic acid from the lime and the water in the clay.

Small quantities of magnesia and iron are in many hydraulic limestones, but these are also in many clays which often have a reddish brown color from the presence of iron.

Hydraulic mortars are also made by mixing burnt lime with certain porous rocks resembling in composition burnt clay, such as the well known pozzuolana, formerly exported entensively from Italy for making hydraulic limes. It occurs at Pozzuoli, near Naples. A majority of volcanic tufas possess similar properties. Most burnt clays, when not too highly calcined, are good substitutes for pozzuolana ; as also are common bricks, tiles and common earthenware pounded. Mortars made from burnt lime and pozzuolana are very hard and durable, as is shown in the remains of buildings at Rome, where the cement has outlasted the rocks used in their construction. The old Roman, Vitruvius, gives the following directions for making this cement:

Pozzuolana, well pulverized	12 parts.
Quartoze sand	6 "
Rich lime, recently slaked	9 "
Fragments of broken stone	6 "

The Rev. Mr. Wilson, principal of the academy at Seguin, informs me by letter that the late Dr. Park, formerly living there, made a very good hydraulic cement by burning the clays in that neighborhood, and mixing them with the proper proportion of burnt lime.

The following are the analyses of some of the best hydraulic cements of France and of the United States:

METZ.

Carbonate of lime	77.3
" magnesia	03.0
" iron	03.0
" manganese	01.5
Clay or silex	15.2

LEZOUX (PUY DE DOME).

Carbonate of lime	72.5
“ magnesia	04.5
Clay or silex	23.0

BOLOGNE—PORTLAND CEMENT, NATURAL.

Lime	65.13
Magnesia	00.58
Silica	20.42
Alumina and a small quantity of oxide of iron	13.87

LONDON—PORTLAND CEMENT, ARTIFICIAL.

Lime	68.11
Silica	20.67
Alumina	10.43
Oxide of iron	00.87

UNITED STATES—ROSEDALE CEMENT, NEW YORK.

Carbonate of lime	46.00
Silica, clay and insoluble silicates	27.70
Carbonate of magnesia	17.76
Alumina	02.34
Peroxide of iron	07.26
Sulphuric acid	00.26
Chlorides of potassium and sodium	04.02
Hygrometric water	00.22
Loss	00.44

The Rosedale is an excellent cement, which is used to a considerable extent at Austin, where it is sold at $3 50 per barrel.

CUMBERLAND CEMENT, ROCK, (MARYLAND.)

Carbonate of lime	41.80
Silica clay and insoluble silicates	24.74
Magnesia	04.10
Alumina	16.74
Peroxide of iron	06.30
Soda	04.64

Potash	01.54
Sulphuric acid	02.22
Hygrometric water	00.60

BALCONY FALLS ROCK (VIRGINIA).

Lime	17.38
Silica	34.22
Alumina	07.80
Magnesia	09.51
Carbonic acid	30.40
Water and loss	00.69

The analyses of many cements in extensive use show quite a difference in the proportion of the lime, clay and sand; yet the best cements have a range of from fifteen to about thirty-five per cent. of silica and alumina.

This range in the proportion of the ingredients renders the making of these cements an easy task.

ZEIDEOLITE

Is a comparatively new material which has lately been largely used in France in place of hydraulic lime. It is said to be much superior to that article for uniting stone and resisting the action of water. It is made by mixing sulphur and pulverized stoneware and glass in the following proportions:

Sulphur	19 pounds.
Stoneware and glass	42 "

Mix and expose to a gentle heat, and stir all thoroughly together, and then pour into suitable moulds and let it cool. It is as hard as stone at 230 degrees Fahrenheit, but at 248 degrees it melts, and may be recast or made into any desirable form by heating. Slabs of it may be joined with a paste of it heated sufficiently to melt the edges of the slabs.

West of the Pecos, adobe houses are the chief and almost the only buildings used, and this is also the custom in northern Mexico. Adobes are made of clay dried in the sun. The general form in use at El Paso, is 24 inches long, 12 inches wide and 4 inches thick. A little straw or hay is mixed with the mud, and then it is moulded into the proper shape. The price of adobes (1875) at El Paso, was $7 per thousand, hence building there is very cheap. Roofs are also made with first a layer of clay, above which is sometimes spread a thin layer of ashes, and above this is placed a thick layer of cement made of clay, gravel and lime; about two-thirds clay and sand, and one of lime. These roofs are nearly flat, only having inclination sufficient to let the water run off. The roofs of the old mission churches near San Antonio were made of cement, and are still in a very good state of preservation. Adobe houses are very cool in summer and warm in winter.

Cement floors are also used in the adobe houses. The mortar is evenly spread to the thickness of three or four inches over a layer of broken limestone. When the mortar has stood about twenty-four hours, and its surface is quite dry, it is pounded all over with a block of wood about twelve inches square, and three to four inches thick, having a handle in the middle. This makes the floor smooth and moist, and when it becomes dry it is again pounded until very little moisture comes to the surface. In some of the best houses, a thin layer of red ochre is then sifted on the floor, and it is thoroughly rubbed in and polished with a smooth, flat stone.

WATER POWER IN TEXAS.

The great objection to utilizing the large and varied water power of the State, has been that heavy rains sometimes caused the sudden rise and overflow of streams, doing more or less damage to mills and factories. In some instances, factories and mills have been swept away, as was done a few years since at New Braunfels.

It is now demonstrated that power can be transmitted to great distances by wire or raw hide ropes. In Europe this has been done extensively—Pirn being the inventor. In one instance by a combination of ropes and pullies, the power of a waterwheel was transmitted to distance of several miles.

A good illustration of this method was lately given in "Mines, Metals and Arts" of Saint Louis, where there is a view of the mills of Messrs. Smyser & Milton, at the falls of the Ohio river, Indiana. There the wheelhouse is two hundred feet distant below and across a race or canal, from the mill on the hill, the power being conveyed by wire ropes running in grooved wheels from the wheelhouse to the mill. By intermediate supports, power can thus be transmitted to the distance of a mile or more.

Mills may be located on hills, safe from overflows, and the less expensive wheelhouse placed below, and often firmly placed, because its small size will give little resistance to the force of the flood.

By the application of this method, the extensive water power of central and western Texas, which is now mostly useless, may be made to be of immense advantage to the State.

BUCKLEY'S FALLS.

In the southeast corner of San Saba, and in the northeast corner of Llano county, are some falls, on Falls creek. These falls I first measured and published a description of in 1860 and '61. I also gave a description of them in my Preliminary Report on the Geological and Agricultural Survey of the State, published in 1866. Last spring we again visited them, accompanied by Col. Jno. M. Moore, who calls them "Buckley Falls," they having previously been unnamed.

The following is the description published in 1866:

The falls of Falls creek, in the northeastern part of Llano county, have a perpendicular height of about one hundred and twenty feet. The stream is about sixty feet wide at the top of the fall, and descends into a basin of about half an acre in extent, of deep, clear water, fine for both bathing and fishing. Ferns, mosses and climbing plants hang in green festoons from the high, rocky precipices, which are on each side of the sheet of falling water. Cedars and other evergreens grow on the surrounding rocky cliffs, and both cedars and live-oaks abound on the broad plateau at the foot of the falls, from which the ascent is by three or four terraces of a few feet each, into the Llano valley.

We were told that there is a fine sulphur spring in the Colorado river not far above the falls, which our limited time did not permit us to visit. These things have an economic value to the people of the State, affording advantages for summer resort which are rarely equaled; such as a pure, healthy atmosphere, mountains, springs, waterfalls, bathing, fishing, hunting, fine carriage drives and horseback rides over the plains, fine climbs up the hills to charming views of varied scenery from their tops. It is just the place for invalids to get strong, and for the healthy to become more robust. Much time and money is spent annually in visiting places abroad far less attractive.

AGRICULTURE.

The agriculture of Texas has made rapid and decided improvements during the last ten years. Large plantations have been divided into smaller farms, and those farms have been better cultivated and better managed. Improved agricultural implements and machinery are now in common use. These things lessen the labor of the farm and make it a pleasurable pursuit. One man and two or three horses or mules can now plow from three to four acres a day with a sulky or riding plow, sitting under an umbrella if he chooses; besides the plowing can be done better and at a more uniform depth than by the old method. The increased crops resulting from the use of these plows is often more than sufficient to pay for them; besides, there is a saving of time and labor, one man being able to accomplish more work than was formerly done by two or more. With improved plows, cultivators, etc., one man can cultivate fifty acres on the prairie lands of the State, and more than this has been done.

Even now the old, very old methods of farming are prevalent in Texas between the Pecos and Rio Grande. In that region the plows in common use are similar to those used by the old Greeks and Romans. The plow consists of a long stick or pole, of from four to six inches in diameter. Another short stick of a little larger diameter, and sometimes no larger, is joined to the first at an angle of about forty-five degrees, and on the lower portion of the short stick a small shovel plow is fastened, and at the upper end are one or two handles. This is the Mexican plow. With this and the hoe, crops are made, and very good crops, on light soils, but on stiff clays, not so good. Grain is cut with sickles or large knives. One Mexican (an expert) will cut and put up, in little stacks, about five hundred pounds of hay in a day. Twenty-five cents, without board, is the ordinary price per hundred for cutting and hauling to market. Four hundred tons of hay for the Government (military) at Fort Davis was thus supplied last year. This was the price paid by the contractor. What he received, I do not know. The ox yoke in common use is fastened by strings of raw hide to the top of the head around the base of the horns. Some contend that an ox can draw more with the yoke thus placed than when fastened to the neck and shoulders. This last method is now there used to a considerable extent—long teams, consisting of several yoke of oxen, some pulling by the horns and others by the shoulders, being occasionally seen.

Some have tried and are now endeavoring to introduce into common use in that region improved agricultural machinery—mowing machines and steel plows, but it is difficult to make the Mexicans use them, and these are the chief laborers of that country. They will work and board themselves at from five to ten dollars per month. The threshing is done on the hard ground, the grain tramped out by horses and chaff winnowed out by throwing the grain up into the wind.

A few more years and this system of Mexican farming will cease in western Texas and give place to the methods in use in other portions of the State; consequent mostly from the influx of immigration into the country between the Pecos and Rio Grande, which is sure to result when its mineral and agricultural advantages are well known.

The grange has had and continues to have a beneficial influence upon the farmers of the State. It unites them and makes them more intelligent in the management of their farms, the marketing of their produce, the buying of their supplies and agricultural implements. It increases their social joys and home enjoyments and makes them wiser and better.

In 1870, I wrote to its chief secretary (Mr. Kelly) at Washington, D. C., for information regarding the objects of the grange. He sent me grange publications, explaining the uses of the order, and also an appointment of special deputy, for organizing granges in Texas. I tried to establish a grange at Austin, and failed. It was too soon; the farmers did not understand and the newspapers of the State opposed and denounced what was then termed the grange movement. Six years has wrought a great change in this respect.

Another important item is the large and increasing attention given to horticulture; the growing of fruits and vegetables, the growth of ornamental trees, shrubs and plants, which embellish and beautify so many homes.

Improved houses for diminishing the labor and increasing the comforts of the family are being made. Such combinations are capable of making the farmer's life more desirable and happy than any other, because his life is not subject to the uncertainties of many other avocations.

The farmers of Texas have a great advantage over those of some of the older States, in not being obliged to buy fertilizers, in order to make good crops. The State Inspector of fertilizers in Georgia says that the people of that State expended in one year $10,000,000 for fertilizers. However, it would be unwise for our people to trust so far to their rich lands, as to raise continued crops and not return anything to the soil. Many years ago, the black lands of Marengo and other counties adjacent to it, in Alabama, were noted for their large yields of cotton and corn, but continued tillage and no manuring has exhausted them so much that now they will not bear profitable crops without the liberal use of fertilizers.

AGRICULTURAL JOURNALS.

Of these, I believe none are now published in the State. Every farmer should take at least one Southern agricultural paper. The best weekly, of our knowledge, is the Southern Plantation, published at Montgomery, Alabama, Dr. H. A. Swasey, editor. Of monthlies, the Southern Cultivator is well known. The Rural Carolinian, published at Charleston, S. C., is another excellent journal.

CLIMATE.

Texas extends from latitude twenty-six degrees south to latitude thirty-six degrees north and longitude from Washington of a little less than seventeen degrees west to more than twenty-nine degrees west; hence it has a great range and great variety of climate, from nearly tropical to temperate.

At Fort Davis, at an altitude of 5000 feet above the sea, in the month of January, 1873, the thermometer was once fifteen degrees below zero, and in 1875, in the same month, it was five degrees below zero, yet yuccas, agaves, dasylirions, cacti, are common on the prairies, in the valleys and on the mountains of that region at an elevation of 6000 feet and upwards. On the mountains the cold was probably greater than at the fort, where meteorological observations are kept, under the direction of Dr. McGraw, to whom I am indebted for a copy of observations kept in 1872, '73 and '74 to 1st of August, 1875. The mean temperature of the thermometer in the summer is less than seventy-five degrees. In the warm season, it is a delightful climate, amid fine mountain scenery, a portion of which resembles towers, domes and precipices of more than one thousand feet in height, perpendicular. In 1872, the amount of rain fall there was 12.16 inches, of which more than half fell in the months of July and August. In 1873, it was 17.65 inches, more than half of which fell in June, July and August. In 1874, it was 20.11 inches, more than half of which fell during the months last named. For the past seven months of 1875 the rain fall was 18.38 inches, fifteen of which fell in July and probably an equal amount fell in August, about the middle of which we left that region, amid rains and floods, which made the Limpia unfordable. These summer rains make plenty of grass and good crops. The annual rain is increasing in that region.

The usual annual rain fall at El Paso is about 8 inches. Last year it was more. At Fort Griffin, there is an average annual rain fall of about 20 inches. It is about the same at Fort Richardson, at Jacksboro. In the north eastern part of the State the annual rain fall is about 30 inches. In the southeastern portion about 40 inches. At Ringold Barracks, a few miles above Brownsville, the average annual rain fall is less than 20 inches. At Fort Duncan, Eagle Pass, about 20 inches. At Fort Clark, average about 25 inches. At San Antonio, a little less than 30 inches. At Austin, the average rain fall for the last five years has been about 35 inches, showing an increase from the preceding five years, when it was about 33 inches, and the preceding five years still farther back, it was a little less than 30 inches. This is from observations kept by Prof. Van Nostrand, principal of Deaf and Dumb Asylum, at Austin.

The increased rain fall in the western part of the State may be partly owing to increased area of land in cultivation, and also to increased growth of the mesquite and other trees in the prairies. What were prairies fifteen years ago are many of them no longer such, but covered with a thick growth of mesquite (algorobia), elm (ulmus crassifolia), and other trees. This may be seen on the road between San Antonio and Seguin, where the former prairies are covered with a luxuriant growth of trees in a soil as rich as the best lands near New Braunfels, now made so productive by the Germans. Throughout most of the State, the heat in summer is seldom more than one hundred degrees. In central Texas, and westward from Fort Concho to Fort Stockton, south winds prevail during the day in the summer time, beginning about 9 a. m. They are generally cool and pleasant. In the valley of the Rio Grande, above Presidio, such winds are far from being of daily occurrence, nor are the cold north winds of winter common there. Below is the range of the thermometer for 18 years at Austin, condensed from Prof. Nostrand's observations:

	High'st.	Low'st.		High'st.	Low'st.		High'st.	Low'st		High'st,	Low'st.
1858	98	22	1863	99	17	1868	96	15	1873	96	13
1859	101	10	1864	99	6	1869	97	19	1874	104	28
1860	107	18	1865	106	18	1870	96	11	1875 to Aug. 1,	99	10
1861	100	23	1866	96	21	1871	102	22			
1862	104	23	1867	98	17	1872	99	15			

BAT CAVES.

We again visited the bat cave in the western part of Burnet county, not far from Bluffton. This cave has large quantities of bat guano, good for the manufacture of saltpetre, or it can be used as a fertilizer, being equal, if not superior, to much of the imported guano.

In the southern part of Llano county there was a bat cave which would have been valuable for its contents had it not been intentionally or carelessly set on fire, which expelled the bats and destroyed the guano.

There are said to be other bat caves still farther west. They are more or less valuable, and should be preserved.

BONES AS FERTILIZERS.

Over the prairies of Texas, especially in the cattle regions, are large quantities of bones scattered on the ground. As is well known, these bones are valuable as fertilizers. In some of the northern counties, buffalo bones lie here and there at short intervals on the plains.

It is said that many of the settlers in Kansas, in the valley of the Arkansas river, have made the gathering of buffalo bones profitable; especially along the railroad lines, to the distance of forty miles on each side of them, these bones have been gathered. Heads and ribs are worth five dollars a ton, being sent to Philadelphia and ground up for fertilizers. Shins and shoulder blades are ten dollars a ton. These are used in the sugar refineries. Horns are worth thirty dollars per ton. The tips are sawn off and sold at manufactories of umbrellas, fans, pipes, etc., and the remainder is used by the chemists. Bits of hide hanging on the heads are used to make glue. Thus every part is used and made useful.

Dr. Voelcker, Chemist of the Royal Agricultural Society, says: "High pressure steam renders bones so brittle that they can be easily ground into fine powder, which is readily assimilated by plants." He adds: "Bone meal, prepared by high pressure steam, contains not much less nitrogen than ordinary bone dust, and as a manure, is far more efficacious and valuable."

Placed in a heap with ashes or sand, and occasionally wet with liquid manure or water, bones decay and make a more soluble and energetic manure than ordinary bone dust. Bones may be soon rendered available for fertilizing purposes by placing them in a large kettle, mixed with ashes, and about one peck of lime to a barrel of bones. Cover with water, and boil. In twenty-four hours all the bones, with the exception perhaps of the hard shin bones, will become so much softened as to be easily pulverized by the hand. They will be in a pasty condition, ready to mix, with much loam and ashes. By boiling a few hours longer, the shin bones may be made soft. Alternate layers of bones and ashes placed in a cask will, in a few months, decompose the combination, being an excellent fertilizer. These methods are cheaper than to dissolve bones by acids, as has been practiced to some extent.

IRRIGATION

Is the chief and probably the only profitable way of raising grain, fruits and vegetables west of Fort Mason, in Texas. It is also largely done in Llano, San Saba, Bexar and other counties west of the Colorado. Properly done, with good cultivation, it is the best and most satisfactory method of farming, because its results are sure to be profitable. Good crops are generally sure, let the climate be as it may. Insects may injure the crops, and grasshoppers sometimes do, but rarely. This is true westward as far as El Paso, because grasshoppers and other insects do but little injury to vegetation in the region under consideration. Grasshoppers in numbers sufficient to do damage, have visited El Paso, only once during the last twenty years. This was in the spring of 1875, when their stay was so short that good crops of fruits, grain and vegetables were made after the grasshoppers had left.

One of the best irrigated farms we saw is that belonging to Messrs. Taylor & Spears, at Ben Ficklin near Fort Concho, in Tom Green county. Here nine hundred acres are irrigated from the south branch of the Concho river. We went over the place on the 17th of June. Six reaping machines drawn by horses were cutting the barley; large barley stacks were being made; barley gathered by horse rakes; threshing done by machines; wheat and oats had been harvested; corn, large and growing luxuriantly. Rarely have we seen so much order and agricultural beauty. Last year (1874), six hundred acres were irrigated, and about fifteen thousand bushels of barley grown; ten thousand of which were sold at Fort Concho at $1.89 per bushel; corn, three thousand bushels grown; worth $2.00 per bushel; oats, ninety tons worth $30 per ton.

All kinds of vegetables are grown, which are suited to the climate. At Mr. Taylor's table we had Irish potatoes, green peas, beans, beets, etc. Fruit trees had been planted and were growing finely. After the barley is harvested, millet and beans succeed.

The river is dammed, which gives an abundant supply of water, at all times, with a fall of water fifteen feet. From twelve to fifteen miles of ditch are made, four feet wide at the bottom, and six feet at the top. These are the main ditches, from which water is conveyed by small gateways into side ditches, running more or less parallel to each other, and from there distributed over the fields so as to cover the whole ground. This is done a short time before sunset or during cloudy days. After the ground is thoroughly saturated, the water is shut off. The side ditches are so shallow as not to interfere with the machines used in harvest time.

At the stage stand, near the forks of the roads leading to Forts McKavit and Concho, are fine large springs, from which about forty acres are irrigated. At Fort McKavit, the troops have irrigated gardens of from eight to ten acres, the supply of water from large springs which are one of the sources of the San Saba river. Here the irrigation is done by letting the water run along a gentle descent between the rows of the plants; hence, the water runs off rather quickly, taking more or less soil with it. It would be better to have the water run around or along the side of the hill, instead of down it; then less water would be needed, and the substance of the soil would be less liable to be washed away.

At Fort Stockton and neighborhood, more than 3000 acres are irrigated and cultivated for the growth of barley, corn, oats, wheat, grapes and vegetables. The water supply is from Comanche creek, which is fed by about fifty springs at the base of the hill on which the fort is placed. Some of these springs are very large, over one of which is a fine bath house. The temperature of the springs is from seventy-two to seventy-five degrees, mostly seventy-three degrees.

Mr. Corbit has the largest irrigated farm. In 1874, he raised about 8,000 bushels of barley, corn 6,000 bushels, wheat 4,500 bushels, and a few sacks of oats.

He is trying to introduce American plows and improved agricultural machinery, but in this he is opposed by his Mexican workmen, who prefer their old rude instruments. However, last year he had a portion plowed with a steel plow, and another portion adjoining plowed with the Mexican plow, and the result being about twice as much grain from the former as the latter, many were convinced of the superiority of the steel plows.

The officers of the fort also have a garden for the growth of vegetables. This is in the valley, about three miles from Stockton.

In the valley of Toyah creek, about 1500 acres are irrigated from the creek, which is fed by several large springs gushing up in the plain and running away with sufficient water and fall for mills and much machinery. Wheat, barley and corn are the principal crops. The forts at Davis and Stockton give a good market for the grain grown here, and also in the Comanche valley near Fort Stockton. The principal settlements on Toyah creek are at San Salomon springs and at Victoria, a few miles below, where Mr. Murphy, of Fort Davis, has several hundred acres in cultivation. At Davis, Mr. Murphy also has a steam flouring mill.

San Salomon springs are 3,250 feet above the sea, in a broad valley. Westward, eight to ten miles from the springs, it is encircled partly by the Limpia mountains, from which the valley extends eastward to the Pecos river, distant about forty-five miles. Northwestward, a branch of it extends about thirty miles to where it intersects another valley leading to Salt Lake, on the Pecos.

Irrigation is done extensively on the Rio Grande in the vicinity of El Paso, extending southward to Presidio del Norte on both sides of the river. On the Texas side are large quantities of productive valley lands, extending forty miles below El Paso, which are more or less irrigated. Below this, very little irrigation is done on the east side of the river above Presidio del Norte. On the irrigated lands wheat, barley, corn and oats are grown; also, vegetables and various fruits noted elsewhere.

On the Limpia, at Fort Davis, irrigation is done to a considerable extent.

In the western part of Kinney county, at the head of San Felipe river, are the San Felipe springs, three or more in number, from which flows the river going with a rapid current about fifteen miles to the Rio Grande, making one of the finest water powers in Texas or any other country. Two large flouring mills are at the little town of San Felipe. On this stream, 3000 acres are irrigated and under cultivation. Corn is the main crop, which, well cultivated, would average forty bushels per acre. So said Mr. Taylor, one of the proprietors of the irrigated land. Wheat is but little raised, average crop sixteen bushels to the acre. Oats grow well. Sweet potatoes do well, and are largely grown for the western market. Irish potatoes are raised to a small extent. All garden vegetables do finely; so do peaches and grapes; other fruits recently planted and on trial. Besides the mills, San Felipe has two stores and from forty to fifty dwelling houses. Sheep and cattle do well, and are kept to a considerable extent in that neighborhood.

Eastward, on the Fort Clark road, at Mud creek, is a large valley, about 700 acres of which are irrigated and cultivated. Below Fort Clark, on the Los Moras, irrigation is extensively done.

Enough land can be irrigated and cultivated in the western part of the State to support a large population, and the minerals of El Paso and Presidio counties, joined with their fine grazing lands, will ere long cause these counties to have a large population.

The valley of the Pecos below the stage station, between Fort Concho and El Paso, has but comparatively little irrigable land; that is, as far down as the ford near old Fort Lancaster, below which we did not see the river. In two or three places, farms of three and four hundred acres can be made and irrigated, and small places of a few acres can be made along the larger portion of the way, but the irrigation would mostly have to be done by hydraulic rams, or what would probably be better, with pumps run by wind mills. Thus stock ranches can be made, and grain and vegetables for family use raised. The stream is deep and rapid, charged with yellowish-brown mud, and confined between perpendicular clay banks six to ten feet high. Hence a person may travel along the river for miles without seeing the water. Cattle cannot get to the water except in a few places at the distance of from eight to ten miles from each other. However, a few hours work with spade and shovel can obviate this, and make roads and paths to the water for cattle.

There is a large permanent spring of excellent water on the west side of the river, eight to ten miles above the ford, near old Fort Lancaster, now unoccupied and in ruins. The spring is at the base of a hill, amid small trees and bushes, where the road turns up and goes around a mountain.

COTTON.

This is the staple of the State, being grown largely throughout most of the agricultural region, except in the irrigated lands of the west, and there it does well, but the distance from market prevents its cultivation.

In 1870, the number of bales raised in Texas is reported to have been 350,658. This year there was probably an equal amount, and perhaps more. Averaging the bales at 450 pounds each, which is a low average, and the average price of the cotton at ten cents, which is also too low, then the sum received, or which can be received for the cotton crop, amounts to $15,779,610, which is a snug sum for the farmers of the State. If they raise their own bacon and breadstuff, and make their own butter, and most of them do, then, as a class, they are doing well, and better probably than any other class in the State. True, the State imports largely of breadstuffs, of bacon, hams, etc.; of butter, cheese and condensed milk; of canned fruits, etc.; but most of these importations are for those living in cities and towns. Better would it be for the farmers of the State if they would produce enough of these things for the wants of its entire people. One thing is certain—the farmers of Texas have great advantages, with a climate and soil adapted to such a wide range of production, and also a good home market for most of their productions.

INDIAN CORN

Is the most general and extensively cultivated grain in the State. On the irrigated lands at the west it is largely grown. At El Paso 75 to 85 bushels per acre are said to have been raised, and much more than this can be grown, for its culture can be greatly improved. Shoots or suckers are there allowed to grow, making ten or more stalks in one hill. Sometimes nearly each one of these stalks has an ear of corn. The average yield per acre of corn in a large portion of the State can be much increased. To show how this can be done, I append the following account of Dr. Parker's crop, taken from the Rural Carolinian:

J. A. W., Carthage, Miss., (among others, both North and South,) having expressed great astonishment in view of the apparently fabulous quantity of corn (200 bushels and twelve quarts,) said to have been grown by Dr. J. W. Parker, of Columbia, S. C., on an acre of ground, and inquiring whether *shelled* corn could possibly be meant, we desired to set the question definitely at rest, (though having no doubt ourselves on the subject,) and addressed a note of inquiry to Dr. Parker. The following is his reply:

COLUMBIA, May 8, 1871.

D. H. JACQUES, Esq.:

My Dear Sir—I do not think that I can better reply to your late letter, or that you could better answer the numerous inquiries concerning the "Premium Corn Crop," grown some years ago on my farm, than by sending copies of my report on "Corn Culture," published among the Proceedings of the Annual Convention of the South Carolina Agricultural and Mechanical Society, November, 1869. In that paper, full information was given on every point of interest connected with the cultivation of this extraordinary yield. I have but a word to add about the measurement.

The acre was within two hundred yards of my barn. The committee assembled early in the morning and the corn was broken in, hauled up and measured in the presence of one or more of the committee, who were all well known citizens. The measurement was by barrels, one or more (three I believe, was the exact number,) were taken at hazard, the contents shelled and measured. The average was then multipled by the number of barrels, and the result obtained.

I wish much that I could find the report of the committee published by the Society of that date; it explained all this I believe, and stated that the committee would be willing to buy or sell by the same measurement. It was not uninteresting at the time to know, that a friend who had walked through the corn a few days before, by counting the ears on several rows had estimated the yield at 213 bushels.

I attribute the success more to timely irrigation, than to any other cause.

Very truly and respectfully yours,
J. W. PARKER.

How Dr. Parker Made his Premium Corn Crop.

Many of our readers have read in the "Proceedings of the Annual Convention of the South Carolina Agricultural and Mechanical Society for 1869," the report of the Committee on Corn Culture, of which Dr. J. W. Parker, of Columbia, was Chairman; but for the benefit of the thousands who have not seen it, as well as to have it here, where it can be referred to at any time, we now re-print it entire. In connection with Dr. Parker's note in our June number, it furnishes a complete history of the wonderful and much debated premium corn crop—probably the largest on record:

REPORT ON CORN CULTURE.

In performing the duty assigned me by the Agricultural and Mechanical Association, I propose, briefly, to give my own experience with the result of two or three experiments. As early as the year 1827, I became convinced that, in the event of a drouth in summer, the ordinary method and routine of planting corn, in my neighborhood, was ruinous in its results, entailing on the planter the necessity of getting his supply elsewhere than from his own field. Acting from the suggestion derived from books on agriculture, I took for my first experiment a level, much-exhausted red-clay field, which produced not five bushels of corn per acre the preceding year.

About the first of December, I started the work of ploughing and subsoiling with bull-tongue ploughs and an old-fashioned Coulter, running two of the former to one of the latter, thus subsoiling every alternate furrow.

Early in February the field was laid off four feet each way with a seven inch shovel, followed by a subsoil plough. In each check a small shovelful of a compost of cotton seed, stable manure and the scrapings of the lots, was put and covered with a tongue plough. In March the field was planted in corn, the seed having been soaked in a solution of saltpetre, and was covered with hoes to the depth of about two inches. As soon as the plant attained the height of three or four inches it was thoroughly ploughed with tongue ploughs and followed by the hoe hands. It received two other ploughings with short shovels, and was laid by before the tassel appeared. The cultivation was level, rather drawing the earth from, than to the stalk, at the early stage of its growth.

The contrast between this and other fields around, during the hot and dry season, was striking. In this field, the vigorous growth and dark green blades gave but little indication of drouth, while in many fields around, the plant was literally being scorched to dryness.

The product was put down at twenty-five bushels per acre, being a gain of at least twenty bushels per acre over the preceding crop.

From the foregoing experiment we learn the beneficial effect of opening the soil for the reception and retention of moisture during the winter, the better pulverization by freezing, and adaptation of the soil for the ramification of the lateral roots of the corn.

It is remarkable that this method of preparing the soil, successfully practiced among the ancients, should have been lost sight of in our country until within the last forty or fifty years, and what is more strange, but few farmers of our day know from their own experience anything of the benefit derived from deep plowing in winter or fall.

In the foregoing experiment, the error committed was in putting the manure in the hill, instead of plowing it in the land broadcast. When manure is put in the hill the plant is vigorously pushed forward, and attains a great height before the shoot appears, and then commonly within three or four blades of the top, consequently distant from its source of nourishment below, and with but little protection from above. Take carefully that stalk from the ground and immerse its roots in clear water. and remove all dirt. You will observe the roots confined to a small circumference, all seeming to grasp the food just at their exit from the stem, and comparatively but few lateral roots. When the manure has been properly ploughed in the land broadcast, the plant at first does not make such rapid headway, but from a wise provision of nature, the lateral roots are being sent out with their thousand mouths in search of food and moisture. They find all that has been bestowed by nature or by the hand of man, and the corn begins to shoot about the time the roots are in condition to bestow their treasures for its support. Just at this important crisis in the growth of the crop, it has been urged by old planters that the ground should have its last good ploughing. I have seen more than one field of luxuriant corn thus ruined. Common sense should admonish the ploughman to stay his hand, and leave undisturbed the delicate little veins or roots in the discharge of their important functions.

To gratify my farmer, as well as to convince him of his error, he was allowed to give what he termed a finish with the plough and hoe to a dozen rows—the result was a decided falling off in yield. The foregoing experiment shows that with the proper preparation of the soil, four feet by four gives sufficient distance on an upland, that the preparation of the land and first ploughing to the crop should be deep, and all other cultivation shallow and level.

My next experiment was of more recent date, and on land very different in character from the first, being nothing more nor less than a quagmire, near by the city of Columbia. It was grown with rushes, willows and sour grasses, abounding with snakes and malaria, through which a serpentine branch made its sluggish way.

My first work was to secure thorough drainage by means of a canal and underdrains, then to clearing and levelling, and third to lime and break up with a two-horse plough, all of which was the work of the summer. In November a heavy coating of cow-house manure was applied, and turned under with a two-horse plough. In January the same process was repeated, and again in March, and the subsoil plough used. In April it was necessary to plough under a luxurious growth of weeds, lime being first applied as at first. In May the hands were again on the ground with manure carts, two-horse ploughs and hoes; after ploughing another coat of manure in, the land was harrowed perfectly level, and laid off thirty-six inches apart; throughout each furrow Peruvian Guano, salt and plaster were sprinkled at the rate of 200 lbs. per acre of each. The seed corn, after being soaked in a solution of nitre, was rolled in plaster and dropped ten inches apart in rows, covered with rakes and the land rolled. Five days after planting, this corn was up and growing. As soon as it was large enough to bear ploughing it was run around with a long, narrow plough, followed by the hoe. There was nothing remarkable in the culture of this lot; it was kept clean by shallow and level culture until it began to shoot and tassel; *irrigation* was then resorted to by conveying from a reservoir a gentle flow of water through every alternate row. Thus the land was kept moist and the plant in a growing state.

The Agricultural Society awarded the premium for the largest yield to this lot, there being 147 bushels per acre produced on two acres.

The following year the same experiment was repeated, except that the rows were thirty instead of thirty-six inches apart.

Inasmuch as there were doubts entertained as to the correctness of the first crop, we were the more careful in having a larger committee to measure and report on this. Their award was the first premium as before, the yield being 200 bushels and 12 quarts of good corn on a single acre. The land was surveyed by the City Surveyor.

From the foregoing remarks and experiments the following conclusions may be drawn:

That success in corn growing depends much upon the thorough preparation of the soil during the fall and winter, which consists in—

1st. Deep breaking up.

2d. Underdrainage on moist flat land.

3d. The judicious manuring.

4th. That the first work should be deep; subsequent work shallow and level.

5th. The roots of the corn should not be disturbed after it bunches to tassel.

Under the old method of culture, the question has arisen whether or not corn can be made a remunerative crop. I should say on our old plantations it cannot. On the other hand, by improved culture, the effects of drouth or scalding from too much rain can be overcome, and instead of harvesting fifty per cent. less than an average crop, as is the case the present year, there would, doubtless, be an increase of fifty per cent. over the average of past years, on the same area of ground. The question would then be responded to affirmatively, and demonstrated by evidences everywhere of increased prosperity and domestic comforts. Fat stock of all kinds would give evidence of full barns, and the old adage would be verified: "It takes corn to make cattle and cattle to make corn."

J. W. PARKER.

The census report for 1870 gives Texas 20,554,538 bushels of Indian corn; the United States Agricultural Report for 1874, 28,016,000 bushels.

OATS

Are extensively grown in Texas, and their cultivation is increasing largely. A gentleman of Travis county raised last year from eleven acres upwards of one thousand bushels of oats. Similar yields have been realized in some of the northern counties of the State. According to the Agricultural Department for 1874, Texas then grew 1,118,000 bushels of oats.

BARLEY

Is grown and does well in Tom Green county; also in Presidio and El Paso counties. It does well throughout a large portion of the State. The report of the amount raised in the State, given by the United States Agricultural Department in 1874, is 63,000 bushels.

RYE

Does very well. Sown in the fall, it gives a large amount of winter pasturage, and in the spring, if cut before ripe, when in flower, it makes good hay. In 1874, 40,000 bushels are said to have been grown in the State, but a large portion of the amount sown was used for forage and pasturage.

WHEAT

Is grown quite largely in the northern and central portions of the State. Texas flour is said to have received the first premium at the Agricultural Fair of last year (1875) at St. Louis.

It does remarkably well at El Paso and in other portions of El Paso county; also in Presidio county. The irrigated lands and mineral waters by which they are irrigated, all being well suited for its growth. We found flour selling at from four to five dollars per hundred pounds at El Paso. A steam mill at San Elizaria, a few miles below El Paso, does a large business in flour.

We were told that one hundred bushels of wheat per acre had been grown near El Paso, the truth of which we doubted; whereupon some of the first citizens of the place assured us that eighty bushels per acre had certainly been realized. The kernel is large and full.

According to the United States census report of 1870, 400,000 bushels of wheat were then grown in Texas. The report of the Statistician of the Agricultural Department at Washington for 1874, gives Texas 1,474,000 bushels for that year, showing a large increase; and its culture is still increasing.

RICE

Succeeds well. What is termed upland rice is grown to a considerable extent; but this is said to be only that raised on uplands from seed grown by irrigation, which yields well for one season when planted on uplands. Thus grown, the seed should be annually renewed. In 1870, 63,844 pounds of rice were grown in Texas.

TOBACCO.

In 1870, 59,706 pounds of tobacco were grown in the State. In 1874, 141,000 pounds.

Jasper, Grayson, Lavaca and Austin are the largest tobacco-producing counties, distant from each other in eastern, northern and southeastern Texas, showing that tobacco can be profitably grown in the larger portion of the State.

BEANS,

Especially the white beans, are cultivated to a considerable extent on the irrigated grounds of the western part of the State, being often planted after oats, barley or wheat. At Mr. Spencer's, in Presidio county, large crops of both corn and beans were raised last year on land not irrigated.

ONIONS.

On the irrigated lands, the El Paso and other onions are largely grown, being in size larger than any I have ever seen elsewhere.

HAY.

In 1870, the hay crop of Texas is reported as being 18,982 tons, and in 1874, 62,000 tons.

SUGAR.

The census report of 1870 gives only 2,020 hogsheads of cane sugar for Texas, much less than was grown ten years before. Southern Texas has a large uncultivated area, where cane sugar can be profitably grown, especially now that improved and less expensive machinery is required for its manufacture. The climate south of latitude 30 degrees is suited to its growth, and it has been successfully cultivated still farther north, as high as latitude 31 degrees.

GRAPES AND WINE.

Two species of native grapes extend from Burnet county northwestward into El Paso county. These are Vitis montana and V. rupestris. The hill sides and valleys of Hays, Blanco, Llano, San Saba and other western counties, are very suitable for the cultivation of the best varieties of American grapes. These grapes are now attracting the attention of many European vine-growers. Last fall, a large order was received from Europe for cuttings and roots of American grapevines by the vine-growers of Pleasant Valley, at Hammondsport, in western New York. The kinds wanted were Concord, Catawba, etc.

At the Vienna Exposition of 1873 the official award gave the first prize medal to the Pleasant Valley Wine Company, of Hammondsport, New York, for the Great Western and Carte Blanche champagne wines, and the diploma to the Urbana Wine Company of the same place, for Gold Seal and Imperial Sparkling wines.

The valley of the Rio Grande at and near El Paso, has been noted for many years for its remarkably fine wines and excellent grapes. More than two hundred years ago grape culture and wine making began at El Paso. The grapes cultivated were probably derived from Europe, but years of cultivation have made them better than the original stock. Two varieties are grown—the black and the yellowish-white grape, both of which are very sweet and juicy, of a very fine flavor, rendering them agreeable to the taste of both old and young. During the season when grapes are ripe from about the first of August to some time in October, all eat freely of grapes, and find them conducive to health.

A late number of the New York Commercial has the following:

"In the vineyard districts of France, Spain, and other vine-growing countries, the medical properties of the grape are well known and understood. The free use of this fruit has a most salutary effect upon the animal system, diluting the blood, removing obstructions from the liver, kidneys, spleen, and other important organs, giving a healthy tone to the animal economy. In diseases of the liver, and especially in that monster compound affliction, dyspepsia, the salutary and potent influence of grape diet is well known in France. The inhabitants of the vineyard districts are never afflicted with these diseases, which, however, alone would not be conclusive evidence of the medicinal qualities of the fruit of which they so freely partake, since peasant life is rarely marred with these ailments; but hundreds who are thus afflicted, yearly resort to the vineyard districts for the sake of what is known as the grape cure, and the result proves to be a cure, except in very long and protracted cases, which are beyond the reach of medical remedies. The invigorating influence of the ripe grape, freely eaten, upon the feeble and debilitated, is quite apparent, supplying vigor and the rosy hue of health instead of weakness and palor, and this, by its diluting property, which enables the blood to circulate in the remoter particles of the skin, which before received only the serous or watery particles."

Since the above was written, several "grape cures" have been established in France, Germany and Switzerland, where the patients are cured by partaking freely of ripe grapes, which they themselves generally pluck from the vines.

This agrees with what we were told of the invigorating properties of ripe grapes when at El Paso. The grapes of this place are said to be better and the wine made from them better than the grapes or wines of places above or below on the Rio Grande. At El Paso there are between two and three thousand acres in vines, many of which have been recently planted. Vines are planted eight feet apart. Each spring the vines are cut back to within from twelve to eighteen inches of the ground, leaving from three to four eyes or buds on the stalk, be it large or small. The older vineyards have large stumps, from which many branches radiate and these branches are loaded with fruit. No trellis used. The vines grow in bush form and almost cover the ground in midsummer. The clusters of grapes are thickly placed on the branches near the top of the stump. Each stump, when at the age of five years or more, will bear from fifteen to twenty pounds of grapes, which will about make one gallon of wine. It is said that each grape vine will grow grapes enough on an average for a gallon of wine. Such are the estimates for vines of five years old and upwards. At eight feet apart, one acre contains 680 vines. At El Paso last summer the wine was selling at from $2 50 to $3 00 per gal. The wine has such superior qualities that there is a ready market for it in Mexico and elsewhere. No sugar used in the manufacture. Mr. Richardson, Mrs. Angestein, Dr. Samoridia and several others have large vineyards for the manufacture of wine. Near El Paso, fine lands which can be irrigated, and which are suited for the growth of the grape or other agricultural or horticultural purposes, can be bought for less than ten dollars per acre. Were it accessible by railroad, property there would be made higher, because it is a a delightful valley, amid fine mountain scenery, a fine, mild, healthy climate, where the Texas northers do not come. It is said these northers do not prevail in the valley of the Rio Grande west of Fort Davis.

Mr. Corbit, ot Fort Stockton, has a vineyard of El Paso grapes. The vines are three years old, look very flourishing and bear a few excellent grapes. The El Paso grape will succed well in the Comanche valley, at Fort Stockton, also on the Toyah and Pecos, all of which have brackish or mineral waters, resembling those of the Rio Grande, whose salts agree remarkably well with this peculiar grape.

HOGS.

West of Mason county, but few hogs are raised, because there are few oak trees and but little "mast," besides there are no fences to keep hogs away from the crops. The few hogs that are kept are not permitted to run at large.

In 1870, the number of swine reported to be in the State, was 1,302,415. The number in 1874, is said to have been 1,147,400.

Texas imports annually, large quanties of bacon, hams, lard, etc. Last year the value of these imports was about $5,000,000, an amount which might and ought to be saved to the State, because with our fertile soil, these articles should be exported instead imported.

HORSES AND MULES.

Texas has many fine horses of imported breeds. Were it not for the thieving Indians and bad white men, large numbers of horses could be profitably raised on the prairies of western Texas. The number of horses reported for the State in 1874, was 720,000, and of mules 101,000.

CATTLE.

Texas has more cattle than any State in the Union. The number reported in 1874, was 2,367,400. Most of the large cattle owners have their cattle under the care of herdsmen who on horseback, go with the cattle here and there over the plains. Some in the southwestern part of the State, in addition have large tracts of land surrounded by fence to keep their cattle on their own land, and keep off the cattle of others, because there are many who have little or no land, yet own many cattle.

Improved breeds of cattle have been largely imported into the State during the last few years.

In 1875, the number of milch cows in the United States, was 10,906,800. Of these, Texas has 526,500, yet she imports annually large quantities of butter, cheese and condensed milk. During the last eight to ten years, butter has been sold largely in Austin at fifty cents or more per pound, and cheese at twenty-five cents per pound. These are winter prices.

SHEEP.

Western Texas has great advantages for the successful keeping of sheep, with its mountains and valleys, and abundant pasturage, joined with a delightful and healthy climate.

I have often said, and say again, that a beginning with 1000 sheep, properly and well cared for, will in a well chosen place in western Texas, (and there are thousands of such places) amount to an independent fortune in ten years. By an independent fortune, I mean an income of from $3000 to $5000 a year. I know of those who with such beginnings in this business, continued for ten years, have realized and now have greater incomes. But this business needs care, energy and judicious management. Some, lacking these things, have been unsuccessful in the sheep business, even in Texas, and others, during the same time, have acquired independent fortunes.

One advantage which the country west and northwest of Austin has, is the almost entire absence of burr weeds (Xanthium strumarium), so injurious to the wool of some portions of the State.

The wages of shepherds in western Texas vary from $5 to $10 per month, without board. These are the prices paid Mexicans, who are fond of the business. The better way is to have a Mexican family, furnished with a small house and garden. A Mexican, with a sheep dog, will take care of from 1000 to 1200 sheep, which is as large a number as ought to be in a flock.

Sheep west of the Pecos are said to be free from scab. Mr. Corbit, who has a flock at Fort Stockton, told me that when he obtained about 1200 from the vicinity of San Antonio, some of them were diseased with the scab, but all have now become well and in good condition, without the application of any remedies. This may be on account of the waters of that region being slightly mineralized, joined with the good pasturage and pure mountain air. Fort Stockton has an elevation of 3000 feet above the sea, and many of the mountains of that region are a few hundred feet higher.

Several thousand sheep are kept along the Rio Grande above Fort Quitman; also about 7000 are pastured in the Chinati mountains, in Presidio county. In 1874, there were said to be about 1,445,700 sheep in Texas.

During the last three years many thousands of sheep have been introduced into the State, especially in the counties west and southwest of San Antonio. About 70,000 sheep are now on the prairies, valleys and hills of Kinney county. Uvalde county has 50,000 or more. Mr. John Kennedy, living on the Savinal, in the eastern part of Uvalde county, has lately sold several thousand cattle for $10,000, preparatory to engaging in the sheep business. About 4000 of these cattle were driven last fall (1875) up into the valley of the Pecos, where they have better pasturage.

In western Texas there is an area of more than 50,000 square miles suitable for sheep, affording more than sufficient pasturage for all the sheep in the United States. In 1874 the number of sheep in the United States was 33,783,600. It is said that an acre will keep three sheep. Suppose that one acre in western Texas will only keep half that number, still it will keep more sheep than are now in the United States.

At present California has the most sheep of any State. 4,683,200 were there in 1874. A gentleman who left California last spring and went through Arizona and New Mexico into Texas, told me last August that 10,000 sheep were on their way from California to Texas over the route which he came. The following is from a late newspaper:

American Wools.

There is still a large opening for the profitable employment of labor and capital in sheep growing, in those portions of this country best adapted to the business. A large amount of wool is still imported from abroad, and the demand grows with our growing population, while some of the old States are not able to compete with the new regions of the Southwest in the production of sheep and wool at remunerative prices. From an article in a leading business publication of New York, it appears that the finer classes of wool are not as profitable to the producer as those of the more common kind.

In this country our finest and best clothing wools are grown in West Virginia (especially the Pan Handle district), Ohio and Pennsylvania. Next in order follow New York, Vermont and Michigan; then Illinois, Iowa, Missouri, Wisconsin and Minnesota; next, California, Texas, Georgia, Louisiana, North Carolina, Alabama and Florida. The New England States, excepting Vermont, do not raise much wool, and in that State sheep are raised more for breeding than wool growing purposes, and some of our best and purest blooded merino stock are bred there. Maine, New Hampshire and Massachusetts raise a few sheep, principally, however, of the Southdown and Leicester cross breeds. The very finest fibred wool is grown in the Pan Handle district, West Virginia, where the sheep are mostly of the Saxony breed; this stock, originally from Silesia, being noted as the finest wool in the world. The sheep, however, are delicate and small, and require careful attention and wintering to keep from degenerating. The fleeces are small, and, as a rule, it does not pay the farmers to raise this breed. The wool is used in making the finest cloths, coatings, flannels and cassimeres.

Ohio used to be the most prominent wool growing State, but now shows a material decrease in production, the land having become more valuable for other purposes. The sheep raised in Ohio are chiefly of the merino breed, either pure or crossed with native stock.

In New York, Michigan and Pennsylvania considerable fine wool is raised; to the last named State is conceded the credit of growing the best, being of more even texture and less greasy than that from the other two. These wools are not so valuable as the Ohio and West Virginia.

The Iowa, Illinois, Wisconsin, Indiana, Missouri and Minnesota wools are chiefly of mixed grades, running into medium. From Georgia, Alabama, Louisiana and Florida the clip is all of a medium to low medium description.

Finally, Texas and California, two large and important wool raising States, produce wools of distinctive character, and adapted for peculiar goods. In these States there are two clips each year, spring and fall. The spring wools are used in connection with Ohio and other better classes, to cheapen stock, and as filling wool, and when of long growth they are spun into warp yarns. The fall clip is employed in making satinets, feltings, and to mix with long stapled wool.

The clip of the United States is principally from sheep either pure or mixed merino breed, and in quality averages from three-quarters to half blood—that is, three-quarters to half merino breed, and one-quarter to one-half native. They thrive well, as they can be kept in large flocks and in comparatively wild pasturage, and our far Western States and Territories—Texas, California, Nevada, Colorado, Kansas and Utah are destined to become the great wool raising country.

Short-stapled fine wool is largely absorbed by the hatting and felting trade, who select generally the fall or spring California or Texas and Cape wool. The goods made are wool hats, seamless clothing, piano and table covers, felt skirts and a variety of domestic goods. The low medium and coarser wools from Northern and Western Texas, Kansas, Colorado, Nevada and Utah, are used for the manufacture of blankets and low hosiery.

In 1873 the amount of wool raised in the United States, according to Mr. James Lynch's report, was 174,700,000 pounds, of which California alone produced upwards of 32,000,000. There was imported about 47,000,000 pounds of foreign wool of all descriptions, the bulk being "carpet." This makes a grand total of 221,000,000 pounds of raw material, or about half that quantity when scoured and ready for the cards. Value about $65,000,000 gold. In addition to wool, we imported in 1873 about $38,000,000 worth of woolen goods, gold value.

BUTTER AND CHEESE.

During the past few years there has been a large increase in the quantity of butter made in the State. There has also been a marked improvement in its quality, showing that Texas cows and Texas grasses will make a first class article of butter. Many of the grass lands at the north, used for dairy purposes, are valued at more than fifty dollars per acre, and with these high priced lands, large profits are realized in the dairy business; hence there can be no doubt but that still greater profits can be made in Texas in the same business.

At the north they have a co-operative system in the large dairy districts, the cheese and butter being made in factories, which is a decided advantage, it being a great saving of labor and expense. But here similar factories can be established, and in Texas the cost of keeping cows, both summer and winter, is much less than at the north.

From the last data at band, the make of butter in the entire country, for 1875, was 600,000,000 pounds, averaging this at thirty cents per pound, and it amounts to $180,000,000. Of cheese there was made about 200,000,000 of pounds, which at twelve and a half cents per pound, amounts to $25,000,000, or the aggregate sum of $205,000,000, marketed in one year from the dairy. This of course does not include the quantity consumed on the farm. 120,000,000 pounds of cheese were exported from the country, and of butter 5,000,000 pounds.

FENCES.

Westward from Fort Mason, as far as El Paso, we found few fences, generally no more than sufficient to restrain stock at night. By day the stock are in charge of herdsmen. This course is found to be much cheaper and better than to endeavor to fence lands for crops. The general absence of fencing material, excepting rocks and adobes, both of which are used for fencing to a small extent, has compelled people to adopt this course.

Were such measures prevalent throughout the prairie region of the State, it would bring more land into cultivation and be better for all parties.

FIBROUS PLANTS, GROWING IN WESTERN TEXAS.

Western Texas has a large wealth of these, which is little known and little appreciated. Its wild mountains, hills, valleys and plains are in many places thickly planted with them, but nature has done the planting.

Of these there are three species of Dasylirion, a genus of the natural order Bromeliacea, to which order of plants also belongs the pine apple (Annanas), and our long "gray moss" (Tillandsia), pendent from trees in the low cotton country. The Tillandsia is used to make mattresses, called hair mattresses.

To return to the Dasylirion: D. tenuifolia has dagger shaped leaves, from twelve to eighteen inches long, armed with serrated edges. These leaves are many and near the surface of the ground, and from the center rises the flower stem to the height of six or more feet. This species grows near Dead Man's Hole, on the Pedernalis, also on the head waters of the Guadalupe and on the hills along Devil's river. The two other species of Dasylirion are common throughout a large portion of the region between the Pecos and Rio Grande. They resemble the preceding species, but differ in their longer and more numerous leaves, which are often three feet long. The stem of one of these species is enlarged, cabbage head like, near the surface of the ground, thickly covered with long leaves. I was assured by some Mexicans and others that this head was roasted and eaten as food, and also, that muscal, a whisky-like liquor, was made from its pulp, the fermented juice being pressed out. The Apache Indians, who dwelt in the region between Fort Stockton and the Rio Grande, made the same use of this plant, and from this custom one branch of the tribe was called Muscallaro-Apaches. At San Salomon springs, on the head waters of the Toyah, I was shown the rocky remains of furnaces used by the Apaches for roasting, for the manufacture of muscal, and for food. Such remains are quite common at the old camping grounds of the Indians throughout that country.

The fibres of the leaves of the Dasylirion have great strength, and they probably are also very durable. An allied plant, Bromelia sagenaria, is used in Brazil for cordage, and the following is related in proof of the strength of the cordage made from it: A rope of it had been in constant use during many years upon the wharf of the city of Paraiba. The heavy anchors belonging to a line of battle ships were hoisted on board a vessel with this same old rope, after hemp cables of a larger diameter had been found inefficient for the purpose. The serrated sharp edges of the leaves of the Dasyliron has prevented them from being used for their fibres; besides the Yucca or Spanish dagger abounds in that region, and so does the Agave or maguey.

The Agave heteracanthe, the leaves of which are used for making coarse cloth, bagging, ropes, etc., in western Texas, near and at Presidio del Norte, in Mexico, is common on and around limestone mountains and hills along the Pecos and westward to the Rio Grande. In many places it is so thick as to make walking among it a careful study, to avoid injury from its sharp pointed leaves. It is called *lechuguia* by some of the Mexicans; others also call a Dasylirion by the same name.

Of all these plants, the Yuccas or Spanish dagger, are the most common. These, joined with the Dasylirions, give a singular beauty to some of the western landscapes.

One species of Yucca, the longifolia, often has very long leaves, some of which I brought home from near Muerto springs, are five feet long; others, found near Devil's river, are five feet six inches, but the ordinary length of the leaves of this species is from three to four feet.

I append the following communications regarding these plants. The two first are from the Rural Carolinian, of Charleston, S. C., and the last from Our Home Journal, of New Orleans:

Texas Istle in England.

The object of this communication is to stimulate as much as possible the growth and collection of this valuable fibre, and to promulgate amongst the producers in Texas the exact state of our European market, as demonstrated in Liverpool. Unlike the past, the present and future are replete with encouragement.

Hitherto, our largest supply of Istle, Isle, Pita de Tampico, or Mexican Fibre, (as it is variously designated), has been drawn from Mexico, and within the last fortnight 1000 bales thence, about two hundred tons gross, have been sold here. The only Texas Istle that we have received so far, has come *via* New York, and, though most of it has been quite equal to the Mexican in quality, some of it, it is to be regretted, has been "cooked" in New York; that is, the superior long fibre has been extracted and the inferior re-shipped here as the genuine article.

In Europe, we use this product enormously for brush and broom making chiefly, for which purpose it is a large auxiliary or substitute for piassava. We can take thousands of tons of it. The supply of both, however, is at present quite inadequate, and piassava has advanced thirty to fifty, and Istle ten to twenty per cent.

The value to-day of ordinary to fine Texas Istle is £41 to £42 10s., equal to $197 to $204 gold per ton of 2240 pounds, at which the Mexican sold. There is no duty, and it sells readily, ex quay, as it arrives.

It is hoped that the agriculturalists of Texas will see to this Istle, and also to its direct shipment to Europe. The Mexicans are getting rich upon it, and, as the river Rio Grande del Norte alone divides the United States and Mexican territories, it is difficult to imagine that there can be any geographical or physical reasons to prevent the Americans going ahead in its increased production with characteristic enterprise.

The last Texas shipment that we are advised of was one of one hundred and four bales, exported by the "Clara Woodhouse," from Brazos, Texas, to New York, which lot is expected here. Interested parties can have samples of the exact thing required, and further information at any time, by writing to the undersigned.

ALEX. S. MACRAE,
Anglo-American Produce Broker, Liverpool, England.

The Ystle and Maguey.

The enclosed communication on the Ystle and Maguey was written by Mr. Hastings, an intelligent American gentleman of Tamaulipas, Mexico, for the Brownsville *Sentinel*, of Texas. Last summer I saw Col. Ford, of the *Sentinel*, and requested him to send me some of the Ystle, and all the information he could about the plant, and here you have the result. The large Maguey (*Agave Ameri-*

cana) is hardy in the open air at Austin, and I think it would thrive in all of the warmer portions of the Atlantic and Gulf cotton States. S. B. BUCKLEY.

Austin, Texas, Oct. 15, 1871.

I see by some of the Northern periodicals that the Ystle plant is attracting some attention, or it may be but curiosity as regards the source from whence is derived the fibre called Ystle, that is being shipped, to some extent, to the United States from Northern Mexico. The plant from which this fibre is extracted is of the *Agave Americana* family, and is called here where it grows, *lechuguia.* It is an evergreen; the leaves are broad at the base, gradually narrowing to the point, which is armed with a strong or sharp thorn or spike; they are slightly concave on the upper side, and armed among the edges with cat's claw thorns. It grows in bunches without trunk or stem, but while it flowers it sends up from the centre of the spreading leaves a stalk of some ten or twelve feet in height, on the top of which comes forth the flower. It flowers but once and then dies. New plants spring forth from the roots of the old one, and thus the supply is continuous.

The above description would answer in every respect for the "Maguey" (*Agave Americana*) plant. The only difference perceptible are, that the latter plant has leaves four or five times as long as the former, are much thicker, of a darker green, and is a larger plant. Ystle is extracted from both of these species, although the "lechuguia" is the legitimate Ystle plant. The fibre of the Maguey is superior to the other, being longer, finer and whiter, and of course commands a higher price.

The manner of extracting the fibre of these plants here is quite primitive, no machine having as yet been found that will give satisfactory results. The work is most all done by hand, the only instrument used being a wooden knife, which serves to scrape off the fleshy parts from the leaf; the fibre is then separated by whipping it around a post, then dried in the sun, and the process is complete.

There are thousands of acres of lechuguia in the State of Tamaulipas. It literally covers the ground where it abounds, rendering it entirely useless for anything, except a secure refuge for snakes and armadillos.

The Maguey is a much more useful plant, and is also a beautiful one. At present the chief use of it is to distill an alcoholic liquor from it called "Vina Mescal," by the natives. The leaves (pencas) are trimmed off from the lower part and thrown away, being most undoubtedly the most valuable part of the plant. The head, or, as it is called, the *pina*, is then roasted, pressed, and the juice thus obtained is allowed to ferment; it is then distilled, and *mescal* is the result. A small portion of the leaves are utilized by the *mescaleros* in thatching their houses, but nine-tenths of them are left in the woods to rot. This plant also yields a sap or juice while standing, from which is made the great Mexican drink known as *pulque*. To obtain this, the centre of the plant is cut away, and a saucer-shaped cavity is made in the solid part that remains below, into which there filters a whitish sap of rather a disagreeable taste to one who is unaccustomed to its use. This sap is called *agua miel*, (honey water), and is highly medicinal in its crude state. When allowed to ferment it becomes *pulque*. It is also subjected to another process, that of slow evaporation over fire, until it becomes of a syrupy consistence. This syrup is very sweet, and is an excellent substitute for molasses.

A good-sized Maguey is very productive. The *agua miel* is drawn off from the cavity above mentioned twice a day, and it continues to yield for several months. From the fibre ropes, bagging, matting, and a variety of useful articles are made; the *pina*, after being roasted, is eaten with relish by the workmen at the distilleries, and is very nutricious, sweet, and has not an unpleasant flavor. The flower stalk is used for rafters for the houses, being from twenty to twenty-five feet in length, and of great strength and durability.

Thus it will be seen that the Maguey is a useful plant, as it gives food and drink of different kinds, and houses to live in, besides other useful articles.

The time may come when these plants will be more protected than they are at present, and, perhaps, cultivated for the fibre which they yield.

I have heard that most of the Ystle shipped to the United States is converted into an imitation of horse hay, and mattresses, sofas, chairs, etc., stuffed with it, and sold as the genuine article.

Bear Grass and Spanish Dagger—(Yucca Filamentosa and Yucca Aloefolia.)

ITS VALUE AS A FIBRE AND ITS MODE OF CULTURE.

It is a native of India, described by Royles in his work on "Fibrous Plants of India," page 57, published in London in 1875; also "Squire's Tropical Fibres, their production and economic extraction," page 61, and is now found growing in all the Southern States and Mexico, is a large spear leaved growth, dark evergreen, the blades or leaves from a half inch to two inches broad, generally about fourteen inches long, and by cultivation can be grown to six feet in length, and contains very valuable fibre for the purpose of making ropes, bagging, matting and all species of coarse cloths. The fibre can be readily obtained by means of a machinery constructed by the undersigned, by means of which the green leaves are thoroughly mashed, and then passing through a process of washing which removes all extraneous substances, leaving the fibre as white as Irish linen and ready for market; the waste by cleaning is less than one-tenth.

SOIL FOR YUCCA.

The plant thrives best on rich soils, growing to a greater length and stronger fibre, but coarser, and in sandy and poor clay soil, grows shorter and of a finer quality, and is known to grow on the highest "piney woods" hill, and in the lowest bottom lands. The cocoa or wire grass has no effect on its growth whatever, neither is it affected by overflow. Anywhere south of thirty-one degrees the first year of planting it will produce two crops per year and yield from fifteen to twenty-five hundred barrels marketable fibre per acre at each crop.

HOW PLANTED AND PROPAGATED.

The yucca is propagated by planting the roots or seed any time in the fall, winter or spring. The yucca aloefolia also may be propagated by planting the stalk cut in pieces and planted like Irish potatoes. The yucca filamentosa has a bulbous root resembling sweet potatoes, and may be planted similar, and needs no replanting for one hundred years. There are patches of the yucca now growing in Louisiana and Mississippi in the woods and briers, where the sun has not shown on them probably for sixty years, and there are others growing on lawns known to have been planted more than one hundred years ago. The older it gets the thicker and more thrifty the growth; it is not only an evergreen, but grows the entire year, needs no enclosure, and is without enemies.

HOW HARVESTED AND PREPARED FOR MARKET.

The green leaves are stripped from the stalk, either by hand or by means of a spud, then run through the yucca cleaner green as they are stripped, then the fibre is ready for baling and the market.

HOW ONE MAN CAN CULTIVATE FIFTY ACRES

A man with a mule can plant and cultivate twenty acres in drills, similar to sugar cane, from the 1st of of September to the 1st of January, and from the 1st of January to the 1st of May he can plant and cultivate twenty acres more, and during the months of May and June ten acres more. The experience of the writer is that it will require but slight or no cultivation after the first year, when planted as a farm product.

The clean or marketable fibre and materials manufactured therefrom were never known to be introduced into commerce, until introduced by the writer of this article in 1867.

Very respectfully,
A. Stoner.

Stony Point, E. Baton Rouge Parish, La., February 19th, 1876.

Remarks.—Our correspondent is mistaken as to his being the first to introduce it to commerce. We have some of the fibre in the office, of which we sent samples to several rope and cordage dealers, calling their attention to it, and some of whom offered to buy the article by the bale, but we could find no one who would gather and prepare it for market. The sample was furnished us in 1872, by Mr. Waterman, of this city, who was the first to call our attention to the value of the fibre. Since that time we have had frequent calls for the fibre by dealers and manufacturers of cordage, and we are pleased to know that our correspondent is taking steps for its culture and manufacture, as it will prove highly profitable, the fibre being superior to Manilla, and will find a ready sale at from 10 to 15 cents per pound.

TANNING MATERIAL—SUMAC, OAKS, MESQUITE, ETC.

There are several species of sumac indigenous in Texas, which abound in tannin, vz: Rhus typhina, R. glabra, R. copalina, R. pumila, R. aromatica, R. virens and R. microphylla. The first four of these grow in the eastern and central portion of the State, the three last in the central and western part. In the east, R. copalina is the most abundant, where it and the first species are often associated, both having the common name of sumac and both being used for tannery. Rhus glabra, or the smooth sumac, abounds in swamps, and is poisonous to some people, to others it is harmless. Rhus virens, or the evergreen sumac, grows on limestone hills in the vicinity of Austin and westward to the Rio Grande. It is a short or small tree. Rhus microphylla, or the small leafed sumac, is common on some of the hills of San Saba county, from which it also extends westward to the Rio Grande. It is a large and much branched shrub. R. aromatica is a shrub growing in thickets on hills near Austin and westward to the Rio Grande.

Sumacs abound throughout the larger portion of the State, apparently so common as to seem to be sufficient to supply tannin for all the tanneries in the United States.

In my last report, page 106, a large tannery at Dallas is noticed. This tannery was reported by one of its proprietors, Mr. Dodge, to be making $160,000 worth of leather annually, using largely for tanning purposes the Texas sumac, paying about $20 per ton for its dried leaves and leaf stems. This company report the Texas sumac to be the cheapest, and to make leather equal to the best.

The following analysis of American sumac is taken from the report of the chemist of the Agricultural Department, at Washington, D. C., for 1869:

1. SUMAC FROM GERARDSTOWN, WEST VIRGINIA.

Tannin	20.80
Vegetable fibre	79.20
	100.00

2. SAMPLE FROM GEORGETOWN, D. C.

Tannin	18.25
Vegetable fibre	81.75
	100.00

3. SAMPLE FROM FREDERICKSBURG, VA.

Tannin	23.50
Vegetable fibre	76.50
	100.00

4. TWO SAMPLES FROM R. T. KNOX & BROS., FREDERICKSBURG, VIRGINIA—AVERAGE OF BOTH.

Tannin	28.20
Vegetable fibre	71.80
	100.00

These sumacs are of the R. copalina and typhina species, which also grow abundantly in Texas.

These analyses show a great richness in tannin, although some of the samples were not of the first quality, yet they show that we can compete in the foreign markets with the best sumacs.

For the purpose of comparison, I give some analyses of European sumacs, as made by European chemists:

Sumac, first quality, tannin	16.50
Sumac, second quality, tannin	13.00

Gauhe gives us an average of six analyses of European sumac from the countries on the borders of the Mediteranean, 13 per cent. of tannin.

Fine samples of Palermo sumac yield from 22 to 24 per cent of tannin.

Sumac is also used for its coloring matter in dyeing and calico printing. It gives, with a mordant of tin, a yellow; with acetate of iron, a gray or black; and with sulphate of zinc, a brownish yellow. The bark of the smooth sumac (*R. glabra*) is used as a mordant for red.

The sumacs richest in tannic acid are said to be those which have small dark-green leaves; hence our small leafed western sumac (R. microphylla) must be richer in tannin than any other known American species, because its leaves are very small and also of a very dark green.

Of late years Virginia has had quite a large trade in sumac. It is now demonstrated and admitted by consumers in our own country and dealers in Europe, that American sumac, well prepared, is superior in tanning material to most of that in Europe. An importing house, having branches in New York, Philadelphia and Savannah, in a circular to the trade, dated Dec. 31st, 1869, states:

"We would call the attention of the trade, to a very fine Virginian sumac, now being received by us, equal in every respect to the finest Sicily. We recommend its use from the following comparison in the analyses:

Finest Sicilian marked with a lead seal. Pojire and ne plus ultra.		Finest American from Virginia.	
Tannin	23.65	Tannin	30.00
Sand	1.00	Sand	.50
Vegetable fibre	75.35	Vegetable fibre	69.50
	100.00		100.00

Alexander Macrae, a produce broker of Liverpool, England, in his Importers' and Exporters' Circular of January 10th, 1870, says:

A great revolution is about to be witnessed in this tanning and dying material. Supplies have commenced to arrive from Virginia, the quality of which is the best that has ever reached Great Britain. The official analysis (Huson), shows that the finest brand of Sicilian, the "ne plus ultra," gives twenty-four and a half per cent of tannin, but the best samples of American (same analysis), yield thirty-one per cent. of tannin.

Yet tons of sumac are wasted annually in Texas, for want of gathering, drying and grinding.

The Dallas Tanning Company have paid $110 per ton for Sicilian sumac. This was before they knew the value of the Texas sumac. For tanning they use Gambier or Terra Japonica, and an extract of oak bark.

Gambier or Terra Japonica, is an astringent substance, sometimes called catechu. It is made by boiling and evaporating the brown hard wood of the acacia catechu, until the juice acquires a proper consistency when strained, and when cool, coagulates. Imported from the East Indies.

The importance and great value which would result to the State, if the hides which are annually exported were tanned in Texas, leads me to dwell on this subject, and append the following article on the tanning properties of the mesquite tree (Algarobia glandulosa), a genus belonging to the same family as the acacia. The wood of the mesquite has a resemblance to that of the acacia catechu, from which the Terra Japonica is made. The article is from the pen of the Rev. J. M. Wilson, who has during many years, been principal of high school at Seguin. It was originally published in the Texas Almanac.

Mesquite a Superior Tanning Material.

Besides the value of mesquite for various purposes indicated, it is destined to be a source of vast wealth to Texas and the world, *as one of the best known materials for tanning and manufacturing leather.* During the war, when we were shut out from the world and cut off from the sources of our supply of the necessaries and comforts of life, we found ourselves under the necessity of meeting these wants from our own resources. Leather was an urgent necessity. Dr. J. Park, then of Seguin, an intelligent gentleman of a scientific turn of mind, directed his attention to the examination of the materials for tanning to be found in Western Texas. He tested the various barks usually used, and found the black jack the richest in tannic acid, live oak the next, and post oak to have the least of the oaks. He then examined the mesquite, and found that the whole body of the wood was rich in tannin. He ascertained that the wood was fully equal to the bark of the black jack in quality and quantity—that it abounded in tannic acid. This was an unexpected and very important discovery. He made practical tests of it, and found it promptly acted in converting the hide into leather of a good quality. He improvised a chopping machine by which he reduced the wood and put it into a form to have the tannin extracted by boiling, and established a tannery, and successfully carried it on for some time after the war. He was so fully satisfied of the value of the mesquite as a tanning material, that he took out a patent for his discovery. The points established by the experiments made with the mesquite are the following, viz:

1st. It is rich in tannin.

2d. It is cheap, and of inexhaustible abundance.

3d. By suitable machinery, it may be readily reduced into a form favorable for the extraction of the tannin by boiling or steaming.

4th. It is prompt and effective as a tanning agent in precipitating the gellatin of the hide and converting it into leather. It forms good leather in a shorter time than the tannin of the oak barks.

5th. The quality of the leather is superior.

6th. Its operation is such, from some peculiarity of the tannic acid it yields, that it prevents the decomposition of the hide, so that the tanning process may be successfully carried on during our hot season as well as during the winter.

The difficulty of tanning successfully in this climate during the hot months, with the ordinary tanning materials, is the liability of the hide to decompose or spoil in the centre before the tanning, which is a powerful antiseptic, can reach it so as to preserve it. With other materials the tanning process begins on the external surfaces of the hides, and gradually progresses toward the centre. Hence the liability of the hide to decompose in the middle and become spoiled before it is tanned. The operation of the tannin from the mesquite is different. When a hide is examined, by cutting it after it has been subjected for a sufficient time to the action of the mesquite ooze, it is found that the tannin has penetrated through and through it, and the tanning process has affected its centre as well as its surface. The whole body of the hide is thus preserved, so that there need be no loss from this cause, no matter how hot the weather is. Western Texas has in the mesquite an agent which will exert a very important influence on her future—a source of exhaustless wealth which will enable her to manufacture all her millions of hides into the best of leather—a material in sufficient quantity to manufacture leather for the whole country. Let tanneries, then, spring up. It is a business, properly conducted, highly profitable. And boot and shoe and harness manufacturing should follow, saving in our own country the immense sums we are now paying to enrich other sections and impoverish our own State. J. M. WILSON.

[The great importance of the valuable properties of the mesquite,as stated above by Dr. Wilson,induced us to ask him, if possible, to furnish us with some corroborative evidence in confirmation of his statements, and in reply, he kindly sent us the following letter, inclosing the one from Mr. Coorpender.]

ADDITIONAL EVIDENCE OF THE SUPERIOR TANNING PROPERTIES OF THE MESQUITE.

NEAR SEGUIN, July 20, 1869.

W. Richardson, Esq.—Dear Sir—Yours of the 2d inst. came to hand during my absence, or I would have answered sooner.

In your letter, after a favorable notice of my article on the mesquite, you mention: "But when you say the *wood* itself is superior to the best oak bark, and that it (the tannic acid) penetrates to the middle of the thickest hides simultaneously with its effect on the surface, I fear the assertion may challenge incredulity with many scientific readers." The statement, I confess, in both its parts, seems extraordinary, and if true, it invests the mesquite with great value and interest as a tanning material. The experiments made with the mesquite were confined to Dr. Park, who discovered it. He established a tannery, and conducted it successfully until the close of the war. It then passed into the hands of Mr. R. Coorpender, near Seguin, who carried it on for some time, but was finally compelled, by the difficulty of getting skilled labor, to abandon it. The proof, then, is confined pretty much to the developments of this single tannery, conducted first by Dr. Park and then by Mr. Coorpender. I am sorry I am unable to give a a statement from Dr. Park himself; it would be interesting and satisfactory. He is now living somewhere in Tennessee. I was with him a good deal while he was making his experiments, and we discussed freely the scientific principles involved, and I am well acquainted with the facts and results. He always stated to me that even with his imperfect mode of extracting the tannin—the chips being coarse and his boiling apparatus imperfect—he found the mesquite wood equal to the best black jack bark, and superior to all others. When properly comminuted and extracted, the yield would be larger than from the best bark. The sap of the mesquite, on exposure to the air, becomes tannic acid. In splitting the wood, frequently the tannin or tannic acid, will be met with in circular crystals occupying small cavities in the body of the timber. From experiments made by Dr. Park in making an extract from the mesquite, he was satisfied that the richness of the wood in tannin was such that, with proper appliances, it would be a profitable business to make catechu from it. The catechu of commerce is made from a tree of the same family with the mesquite, the acacia catechu of India.

With regard to the action of the mesquite tannin in striking through and through the hide, instead of beginning on the external surfaces and gradually carrying the tanning process into the interior, I learn that it is a process which marks some other tanning materials. In a conversation with Dr. Lyon, of San Antonio, an intelligent gentleman who is engaged successfully in the tanning business in a small way, he told me that the bean used in Mexico for tanning, the name of which I have forgotten, and also some other article—perhaps catechu—operated in the same way. It is a highly important quality of a tanning material in the southern country, as it pervades the whole body of the hide with its antiseptic virtue and prevents decomposition. The experiments made during the war in tanning with the barks of the country during hot weather were attended with great loss from the hides spoiling in the middle before the tannin reached it. In cutting the hide, the external surfaces are affected by the tannin, but the middle was decomposed, and the hide would split open. Dr. Park, to show me the manner of the action of the tannin of the mesquite, cut into the hide, and the section revealed plainly that the process had passed entirely through, affecting the centre as well as the surface. It is not to be understood that the whole body of the hide was perfectly tanned, but that colored fibrous lines developed in a few days passed from surface to surface, showing that the whole body of the hide was penetrated by the agent, and secured it against all danger of decomposition. Dr. Park lost no hides after adopting the mesquite, and was satisfied that, with ordinary care and skill, all danger of failure from that source was removed, even in the hottest weather. All the facts revealed respecting the tanning properties of the mesquite convince my mind fully of its excellence—of its special adaptiveness to our climate, and that it offers exhaustless resources for the manufacture of all our hides into leather, and indeed, all the hides of the United States. Farther, I think it will be found that our country, with this material, has advantages over the north in the manufacture of leather, as far, and perhaps in a greater degree, than it has in the manufacture of cotton and woolen goods. The warm temperature of the climate the year round will hasten the perfecting of the chemical process of making leather, while our climate is also equally in our favor in cotton and woolen manufacture; but the cheapness and abundance of the raw material gives us advantages that must make these manufactures more profitable here than they can be where the raw material has to be imported at great expense. All we want is capital and skilled labor, and these cannot much longer be kept from our country when they can be so profitably employed.

LETTER FROM MR. COORPENDER.

River Side, Near Seguin, July 20th, 1868.

W. Richardson, Esq.—Dear Sir—The Rev. Mr. Wilson read me his reply to your communication calling for additional statements and explanations by way of corroboration of his description of the mesquite as a tanning material. I am happy to be able to state that my experience in the use of the mesquite as a tanning agent confirms in the fullest degree all that Mr. Wilson has written as to its qualities and even more

I will remark that I was connected as a partner with Dr. Park for two years in the tannery. When he left, I carried it on myself for a year, and only abandoned it from the difficulty of procuring skilled labor to carry it on. I will give, under different heads, my views of the mesquite, derived from experience and observation.

1st. As to its richness in tannic acid, according to actual test, it is richer than the best of bark. When properly comminuted, and the tan well extracted, its amount is enormous. The whole body of the tree, limbs, twigs and all, are used.

2d. The tannin is different in its qualities and its energy as a tanning and antiseptic agent from other tanning materials. Its mode of operating is different from most others. Instead of being confined to the surfaces, it strikes through and through the hide very promptly. In less than five minutes, a thick hide will show that it has been pervaded by its influence. A simple fact will illustrate its peculiarity in this respect. A negro man who was a practical tanner was asked by Dr. Park, while at work with his material in tanning, how he liked it. "Why," says he, "massa, it differs from anything I ever saw. Other things tan as they go, but this strikes right through the hide." This peculiarity was manifest to the negro, and struck him with force. When I stopped operations, I had a few hides on hand. They were about half tanned, and have lain in a very weak ooze for eighteen months without any addition of tan. They are as sound now as the day they were put in. There is no difficulty at all in tanning hides during the hot months. The preserving property of the article is so strong there is no danger of decomposition. Neither Dr. Park nor myself ever lost any hides, although worked in during the hottest months, while others using bark lost largely.

3d. With regard to the quality of the leather, I regard it as decidedly better than that made from the usual materials. Workmen in leather pronounce it superior. It is remarkably firm and durable, outlasting northern leather. This fact is so generally understood, that I could sell any amount of it if I had it on hand.

4th. Another peculiarity of mesquite ooze is, that no matter how strong it is when the hide is put in, it never burns the leather or causes the grain to crack. Other strong oozes would ruin the leather. We employed an old tanner, who was raised in a tan-yard, and had worked for thirty-five years at the business; he was greatly delighted with the material, and looked upon it as being the best he ever knew.

The foregoing statement of facts I feel fully authorized to make, from my own observation and experience. I do not feel that they give anything more than a truthful view of the merits of the mesquite. I am fully satisfied it offers to Texas an inexhaustible source of wealth; and it should be a source of large profit to Dr. Park, who has brought it out to a knowledge of the public, and has placed it before the country.

Yours respectfully,
R. J. COORPENDER.

This and my communication were read to General J. R. Jefferson, of Seguin, an intelligent and practical gentleman. He brought the mesquite to the notice of Dr. Park. He fully sustains the representations made of the mesquite as a tanning agent. He has used and is now using the leather made from it, and regards it the strongest and most durable he ever saw. J. M. WILSON.

Texas has more than fourteen species of oak, all of which have more or less tannin. Experiment shows that oak bark cut in the spring has more tannin by four and a half times than when cut in the winter. It is also more abundant in young than in old trees.

When at Isleta, in El Paso county, Mr. Blanchard of that place showed me a plant used by the Mexicans for tanning. It flowers in early spring, and I did not see its flowers or fruit, but judging from its leaves and roots, it is a species of Rumex; some of which are called "dock." Polygonum amphibium, which belongs to the same family of plants, has lately been used for tanning in some of the Western States. This plant abounds in wet places in eastern and northern Texas.

FRUITS AT THE WEST.

The grape noticed elsewhere is the chief fruit in the valley of the upper Rio Grande. At El Paso, and down the valley to Elcearia, pears, apples, plums, apricots and peaches are also grown; all being in common cultivation.

I never saw such large pear trees as grow there, in any other county. At Elcearia, are several, some of which I measured, which have a circumference of from 8 to upwards of 9 feet at 3 feet from the ground. Such trees are on the grounds of Mr. Ellis, in the town. Mr. Ellis also has a large vineyard, also apple trees and other fruits. One apple tree which he says is an excellent winter fruit, keeping in good condition, through winter even until July. There I saw strawberries, raspberries, blackberries and even currants and gooseberries, but these two last do not do well.

Elcearia has a few acres of various kinds of fruit around many of its dwellings

There Col. Jno. M. Moore, measured a pear tree, which is called by him the Caroline pear tree, in honor of a little daughter of its proprietor, whose name I have forgotten.

The tree has a circumferance of ten feet at the height of six feet from the ground, a spread of limb of more than sixty feet and estimated height of about fifty feet. It is pyramidal in shape.

All things considered, this valley seems to be one of the best fruit regions in the State.

TREES AND PLANTS.

The "Siempre vivre," of the Mexicans, or the "Resurrection plant" of the florists (*Selaginella lepidophylla*), grows on limestones, at or near the tops of hills and mountains, from the Pecos river, near old Fort Lancaster, westward to the Rio Grande.

It has the remarkable property of reviving when placed in water or in a moist soil, after having been dry and apparently dead for months or years.

Some of the western grasses are almost equally tenacious of life: during drouths they are dry, withered and apparently dead, losing their green color; but when rains come and thoroughly wet the ground, these same grasses become green and begin to grow again, imparting additional beauty to the landscape, and afford nutritious food for herbivorous animals.

The buffalo grass (Buchloa sesleroides), is a well known example.

There is a plant which is a native of Palestine and Arabia, which also will recover its original form, however dry it may be, on being immersed in water. It is called the rose of Sharon, or rose of Jerico. Its botanical name is *Anastatica*, of the natural order crucifera. The following somewhat exaggerated notice of it appeared in a late publication:

The rose of Sharon is one of the most exquisite flowers in shape and hue. Its blossoms are bell-shaped, of many mingled hues and dyes, and its history of legendry are romantic in the highest degree. In the east, throughout

Syria, India and Arabia, it is regarded with the profoundest reverence. The leaves that encircle the round blossom, dry and close tight when the season of blossom is over, and the stock withering completely away from the stem, the flower is blown away at last from the bush on which it grew, having dried up in the shape of a ball, which is carried by the sport of the breezes to great distances. In this way, it is borne over sandy wastes and deserts, until at last, reaching some moist place, it clings to the soil, where it immediately takes fresh root and springs to life and beauty again. For this very reason, the orientals have adopted it as the emblem of the resurrection. The dried flower is placed by the Judeans in a vase of water beside the beds of the sick, and if it expands by moisture, the omen is considered to be favorable. If it does not, the worst at all times is feared.

FORSYTHIA SPLENDENS.

This is a large shrub, having a cactus-like appearance, and is by many supposed to be a cactus. It grows on table lands and mountain tops, on limestone rocks or in limestone soils. It is a prominent feature, and gives a singular appearance to many a landscape between the Pecos and Rio Grande. It grows to the height of from ten to fifteen feet, sending out numerous and nearly straight branches from the top of its stem or bole, which is only about six inches long above the surface of the ground. These branches are generally unbranched, having dense clusters of deep green leaves placed at short intervals along the stem. At the bases of the leaves is one and sometimes two spines about half an inch long. Its flowers are trumpet shaped, of a red and scarlet hue, in quite dense clusters at the ends of the branches. The branches ascend at various angles, diverging and forming an open top.

Mr. Spencer, who lives on the Rio Grande, about twelve miles above Presidio del Norte, in Presidio county, has a door yard fence, made picket fashion, from the limbs of the Forsythia, which is called "ocotea" byt he Mexicans. He intends to make a hedge of the ocotea by planting it a few feet apart and train its limbs into the line of the fence. These limbs are when grown, two or three or more inches in diameter and sufficiently strong to turn cattle. The ocotea grows vigorously.

STROMBOCARPUS,

Called "screw bean," and by the Mexicans tornilla or tornea, is common in the valley of the Rio Grande from Presidio to El Paso, extending upward into New Mexico. It grows in clumps, having stems three to six inches in diameter and a height of from ten to fifteen feet, numerous branches and many thorns of a grayish-white color and about one and a half inches long; has acacia-like flowers, colored yellow, and dense clusters of pods twisted like the threads of a screw; hence its scientific and common name. It has finely pinnate leaves. I have sent seeds of it to several nurserymen, who wish to introduce it into cultivation.

There is a pine growing in the mountains of Presidio and El Paso counties which is probably the Pinus cembroides of Mexico. On the headwaters of the Limpia, fourteen to twenty miles from Fort Davis, are several hundred acres of it, valuable for its timber. It has a height of about fifty feet and a diameter of from twelve to eighteen inches. East of El Paso about fifty miles, there is a large pinery, extending (so said), several hundred miles. Its trees are often two or more feet in diameter.

At El Paso, furniture made of it is quite largely used. When grained, it has a fine finish of a light yellow and brown shade.

MESQUITE (ALGAROBIA),

We found westward along nearly our entire route to the Rio Grande. West of Fort Concho it becomes dwarfed into a shrub of very large roots. At Fort Stockton and other places, its roots are used for fuel, for which they answer an excellent purpose. They are dug up by the Mexicans and sold at a moderate price, the large roots or underground stems being near the surface.

In central Texas and southward beyond San Antonio the mesquite sometimes has a diameter of two or more feet. Its wood is very durable, makes good fuel and has large tanning properties. A decoction of its roots is said to be a good remedy for bowel complaints.

It exudes a gum during the dry summer time, which much resembles the gum acacia.

In going westward from the headwaters of the Concho, at Centralia, we found no trees to the Pecos, and none in the Pecos valley near the bridge at the El Paso stage crossing, but shrubs of the mesquite (Algarobia) and several species of Acacia were quite common. Beyond the Pecos, on the Fort Stockton road, at and near Escondido springs, we again found small trees of the Texas china tree (Sapindus) and Chilopsis lineata, the last of which is cultivated at Austin.

At Fort Stockton there is but one tree more than six inches in diameter. This is a cottonwood (Populus) of a diameter of about eighteen inches, and height of fifty feet. This is at the Government gardens. This will not long be so, for many cottonwoods have been planted, and these are rapid growers.

At Fort Davis, we found wood selling at about seventy-five cents a "burro" load. These are large packages tied on the back of a jack or burro, in charge of a Mexican.

About twelve miles beyond Fort Davis, westward, is Skillman's Grove, a beautiful valley amid fine mountain scenery, shaded with large spreading live oaks and an undetermined species of oak. Beyond the Barrel spring, westward, to Muerto, no trees are seen; but shrubs are not rare until within three or four miles of the stage stand, and beyond this for several miles there are no shrubs. Not knowing this, we had to go supperless one night at the Muerto springs, and go nines miles westward next morning to breakfast, because we had no wood or fuel.

Westward we saw but a very few small trees along the road, until we came to the Rio Grande, where we were cheered with the sight of trees again. Shrubs abound along the route, giving a sufficiency of fuel to travelers for cooking purposes. This is only near the El Paso stage road from Fort Davis. Amid the mountains, on either side, oaks, cedars and pines abound. These I saw in the vicinity of Eagle springs, at Van Horn's well, and also at the Muerto, showing that there is a sufficiency of fuel for the domestic use of a large agricultural population—stock-growers chiefly, for this is eminently a stock-growing country.

Cottonwoods and willows are the principal trees in the valley of the Rio Grande. These trees along the ditches or seches used for irrigation, add beauty to the landscape.

EUCALYPTUS GLOBOSUS.

This Australian tree has been planted quite extensively at the South, including Texas. It will not endure more cold than the orange; hence it will not thrive in the open air in the interior of the State. In its native land it has a moist and warm climate.

China tree (*Melia azederach*) is very hardy throughout the State. It grows rapidly, and will thrive in almost every variety of soil. Its wood is durable, making good fence posts. A writer in one of the cotton States east of the Mississippi river has lately recommended the china tree for hedges, saying that live fences of it can be made with one-fifth the expense that would be required for any other fence. There is no doubt but that live fence posts can be had in from three to five years by sowing the seed in a drill where the fence is wanted.* In Texas it will be necessary to protect the young plants from cattle.

TREE PLANTING

Ought to be encouraged throughout a large portion of the western part of the State. Much has been written during the last few years of the effect of trees on the rain fall, some saying they increase it, others that they do not. Experiments to test the question, lately made in France, seem to show that trees do really increase the rain fall. If the leaves of trees attract and diffuse moisture, so also do the leaves of growing plants, cotton, corn, etc. In central and western Texas, there has been a large addition to the cultivated area during the last fifteen years, and so also has there been an increase in the rain fall.

EFFECTS OF FORESTS ON HEALTH.

It seems to be generally known by scientific observers, that forests or even a few trees are beneficial by checking miasmatic vapors. In certain localities in Europe, especially Italy, screens of trees have protected the inhabitants from fevers, which were prevalent near marshes on the other side of them. Certain commissioners in Tuscany advised the planting of rows of white poplars to intercept the currents of air from malarious districts. Large plantations have been planted in the alluvial soils in Italy, with favorable results in preventing the spread of noxious exhalations from the marshes. The healthful influence of the piney woods of the States bordering on the Gulf of Mexico has long been known; hence, many owners of plantations on the alluvial soils of rivers and streams have their homes in pine woods, sometimes two or three miles distant from their farms. Lieutenant Maury believed that a few rows of sunflowers planted between the Observatory at Washington and the Potomac marshes, had saved the inmates of the Observatory from the intermittent fevers to which they had been liable.

The uniform temperature and humidity of forests, except in tropical climates, are considered to be favorable to health.

Fifteen years ago I went from Austin by way of San Antonio to Corpus Christi, and returned by a different route passing over much prairie land. Again last spring (1875), I passed over a large portion of the same country, and was surprised to find many of the prairies of 1860, thickly overgrown with a large growth of mesquite trees. These trees may be and probably are one cause of the increased rain fall of that region.

GRASSES.

Both central and western Texas are peculiarly rich in nutricious native grasses, good for both hay and pasturage. A small mesquite grass, which is common in central Texas, extends westward to the Pecos, beyond which I only saw it in one place in the Escondedo valley, on the Fort Stockton road. It is the *Buchloa* of botanists, and the buffalo grass of the western plains outside of Texas. It is about six inches high, forms a dense turf, often has stolons or runners one to two feet long, by which it is mostly propagated, its seeds being few and on different plants from those having the male flower.

West of the Pecos there are two or more species of "grama" grass (*Chrondosium*), valuable for their hay and pasturage; a large species (*Chrondrosium foenum*), having height of from two to three feet makes an excellent hay, being said to be almost as good fodder as oats. It is common in Presidio and El Paso counties. Another species of grama grows in tufts about twelve inches high, on the gravely uplands of the Rio Grande valley. This is also useful for fodder and pasturage. Besides, there are twenty or more species of grass between the Pecos and Rio Grande, clothing the valleys and many of the mountains with green, specimens of which we collected for the State collection, which now has more than one hundred species which are natives of the State.

Higher rents are received for the grass lands of Liecestershire, in England, than for other lands cultivated for grain or vegetables in that region. Even in Texas, in the vicinity of Austin, as high as from forty to fifty dollars per acre have been received from lands in one year, on which the Colorado grass (Panicum Texanum) was grown. Hay from this same grass is worth at Austin (March, 1876) twenty-five dollars per ton. There are millions upon millions of acres of fine grass lands in Western Texas now lying idle, giving no profit to man. Here is undeveloped wealth, not subject to the uncertainties of mining and many other occupations.

Last summer, in some of the valleys of Presidio and El Paso counties, the grass was more than six feet high, but only in small patches of one species.

LUCERNE OR ALFALFA, (*Medicago Sativa.*)

There is another species of Medicago, the *lupulina*, which is also sometimes called lucerne. It has yellow flowers. The alfalfa (*M. sativa*) is more extensively cultivated in Europe and America. It was introduced by the Spaniards into Mexico many years ago, and is now largely cultivated in California. Its top roots going down from two to three or more feet render it well adapted to endure drouth. It yields largely of forage, and makes a very good hay. It should not be pastured close, because it is liable to be destroyed by stock biting off the top of its roots. It is cultivated to some extent in El Paso county.

WILD ANIMALS.—BUFFALO.

In the winter thousands of them pasture in the upper valleys of the Concho, in Tom Green county, coming as low down as the Twin mountains. This is the farthest south of their range in Texas. They do not go west of the Pecos, which may partly be owing to the steep banks and swift, deep waters of that stream.

DEER

Are not as numerous as they were fifteen years ago, when large herds of them were quite common on the prairies and in the open woodlands. It is said that a disease, called the black tongue, has killed large numbers of them.

ANTELOPE,

Which were formerly quite scarce, are now quite common (much more so than deer) in the unsettled and thinly inhabited regions of the north and northwest.

BEAVER.

We saw a beaver dam on the Concho, in Tom Green county.

CIVIT CAT OR CAT SQUIRREL (*Bassaris astuta*)

Are quite common in Llano and the adjoining counties, where they are sometimes tamed for pets.

WOLVES

Are few and far less numerous than formerly, thousands of them having been killed with strychnine, etc., stock men having waged war upon them on account of their depredations upon young cattle and sheep.

PRAIRIE DOGS

Are extending their boundaries and increasing in numbers. Fifteen years ago we saw them only a few miles south of Camp Colorado; now their towns are in the northern part of San Saba county.

RACCOONS

And Opossums are common.

SKUNK.

Of these there are two species. The common northern one and the little striped one (*mephitis bicolor*).

American tigers and wild-cats are occasionally met in the unsettled regions.

Flying squirrels and several other species are also here.

Jack rabbits are less numerous than formerly, and so are also two smaller species, once very common on the prairies and elsewhere.

I have thus glanced hastily at a few of the prominent animals of the State, without attempting to group them into families or give their scientific names.

GAME AND OTHER BIRDS OF TEXAS—PRAIRIE HEN, PINNATED GROUSE (*Cupidonic Cupido*).

In some of the northern counties (Clay, Wichita, etc.,) the prairie hen abounds. There we saw large numbers of them in the autumn of 1874. Last summer, did not see any on our route to El Paso and back to Austin.

QUAIL, PARTRIDGE.

Of these there are five species known in Texas. Bob White, *Ortyx Virginianus*, is quite common in nearly every part of the State. Last summer, in going from Fort Quitman down the Rio Grande to the Hot springs, I heard his well known call.

Another species, *Ortyx Texanus*, much resembles Bob White, and is common in southwestern Texas and in the southern valley of the Rio Grande, and northward to the Pecos. It is so like Bob White that it is often supposed to be him.

Gambel's partridge, *Lophortyx Gambilii*, is occasionally seen on the upper Rio Grande, in the neighborhood of El Paso.

Blue partridge, *Callipepla Squmata*, breeds in the lower valley of the Rio Grande, and northward to Presidio county.

Massena partridge, *Cyrtonyx Massena*, is occasionally seen on the hills of Travis county, and extends northward to the Rio Grande in El Paso county. Common on the Pecos and westward.

WILD GEESE—CANADA GOOSE, (*Bernicla Canadensis*).

Large flocks of wild geese spend their winters in Texas.

DUCKS

Of various species are numerous in a large portion of the State in the winter time. Some species breed and remain through the summer in the unsettled regions.

WOODCOCK (*Scophax Minor*),

Is sometimes seen in the wooded region of eastern and central Texas, but it is not abundant.

PLOVER.

At least one (perphaps more) species of plover stay in Texas throughout the year. These birds are very common on prairies and in fields in the winter time, and in summer in the vicinity of water. There is no doubt but that there are several species here during winter.

WHITE CRANE—WHOOPING CRANE, (*Grus Americanus*).

These are our largest birds; at least they are the tallest; when full grown and erect, five feet high, and weighing about fifteen pounds. In the southern part of the State, I have seen them in Matagorda county.

SAND-HILL CRANE (*Grus Canadensis*),

Is common in small flocks on the prairies in the winter. A white heron and a brown heron both breed and stay in the State during summer.

WILD TURKEYS.

Was disappointed in not seeing wild turkeys between the Pecos and Rio Grande.

On our return we saw a few in the valley of Devil's river, but failed to secure any. In the Wichita region, in the northern part of the State, they are very numerous, from whence they live, and are more or less common southward to the Gulf of Mexico.

Below is a notice of a few other birds.

CROWS

Stay and breed here, but I have not seen them west of Llano and Mason counties.

RAVENS

Come eastward as far as the mountains of Llano and Mason, and dwell westward and northwestward to the Rio Grande and El Paso. Last summer we often saw them at our camp to get the crumbs as soon as we left to go onward.

At Austin we are cheered, both summer and winter, by the songs of two of the best native songsters in the United States, the mocking bird and cardinal bird, both of whom delight to dwell here. The mocking bird goes westward and southwestward into Mexico. I do not remember to have seen any cardinal birds west of the Pecos.

BARN SWALLOWS.

Adobe houses, with their wooden supports for cement and clay roofs, form comfortable and convenient places for the nests of these birds, and large numbers of them nestle there, they being so cheerful and good natured that they are seldom if ever molested.

Cliff swallows build their nests and live in communities on and under the high precipitous rocks of rivers and streams. They are noisy and active, full of life and fun.

MANUFACTURES.

Although strictly speaking they do not belong to the geological and agricultural department, yet they have such an intimate connexion with it, and are so essential to the mining and agricultural prosperity of the State, that a brief summary of the advantages which Texas has for manufacturers seems to be very appropriate.

FIRST TANNERIES.

Texas has hides, a great abundance of tanning material, as has been shown elsewhere, and a home market. Now she exports hides, and imports leather, boots, shoes, harness, etc.

IRON.

Of iron ores Texas has an inexhaustible supply in its eastern, central, western and northwestern parts; ores as good as those of any country, and superior to many ores which are smelted and manufactured in other States and countries. She also has an abundance of suitable materials for the manufacture of iron, coal, wood, etc., and a home market for railroad iron and iron wares of every description, because she now imports largely of these things.

AGRICULTURAL IMPLEMENTS.

For the manufacture of these, eastern and some parts of western Texas have great advantages. In the eastern part of the State excellent timber for these purposes abounds; ash, oak and pine. On Little river, in Milam county, and also in some places on the Colorado, below Austin, large trees of the "bastard white oak," (*quercus durandii*).

The wood of this oak is tougher and better than that of the common white oak.

WOOLEN FACTORIES.

The trial of these at the South has proved successful. There are a few in operation in the State. One which we visited at New Braunfels, last fall, is said to do a large and profitable business. The advantages for the manufacture of woolen goods in Texas are like, in many respects, to those for cotton.

COTTON FACTORIES.

Cotton factories have proved to be profitable at the South, many factories giving from twenty to thirty or more per cent. profit on the investment.

Great Britain buys nearly three-fourths of the entire cotton crop of the South, and is said to make more profit from its manufacture than is realized by the South from its sale.

England paid the United States last year for cotton $180,000,000, and by making it up into fabrics, she added $188,000,000 of value to it as a profit—more than double her money.

True, England has superior machinery and cheap and skilled labor, but Texas has other advantages which may be made to overbalance these. She can import the best of machinery suitable for making the best and finest goods, and also import laborers to run the works; and to make these laborers efficient, they should have a share in the business in order to make them interested in its success. The advantages which Texas has over Old England and New England are, a superior climate. Here it will cost less to heat the factory buildings; here living is cheaper; fuel is also cheaper, both wood and coal; the brown coals or lignites of Bastrop, Robertson and other counties, being good to run the engines of the factories, as has been tested at Bastrop. The buying the cotton from the farmer would save the profits—and they are not small—which are now realized by middlemen. Transportation would be saved. The best of water power abounds in nearly every part of the State. The proprietors and operatives of factories will buy a large portion of their food from the farmer, and thus give him a home market, not only for his cotton, but also for his surplus grain, meat and vegetables. With such advantages, Texas can manufacture cotton cheaper than either New England or Old England, and she may have as much or more profit from its manufacture than she now receives from the growth of the staple. Texas can be made one of the most independent and pleasant countries in the world, with her delightful climate, varied scenery, fertile soil, and advantages for manufactures.

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STATISTICAL REPORT.

OF

TEXAS;

SHOWING THE COUNTRY ADJACENT AND ON THE LINE

OF THE

Memphis, El Paso & Pacific Railroad.

COMPILED FROM VARIOUS AUTHENTIC SOURCES.

New-York:
STOCKHOLDER JOB PRINTING OFFICE,
72 William Street.
1867.

INTRODUCTORY.

The following statement of facts have been carefully compiled from the most reliable sources, and will give a true description of that portion of the State of Texas adjacent and situated on the line of the Memphis, El Paso and Pacific Railroad. This company has a special land grant of 10,240 acres of land per mile by its charter. The lands are held in a reserve which extends eight miles on each side of the surveyed and recognized line of road, from the Arkansas State line through the counties of Bowie, Red River, Lamar, Fannin, Hunt, Grayson, Collin, Denton, Tarrant, Wise, Parker, Palo Pinto, Buchanan (or Stephens), Shackelford, Jones, and the land districts of Young, Bexar, Presidio and El Paso, to the town of El Paso on the Rio Grande, a distance of 788 miles from the Arkansas State line and 813 miles from the town of Jefferson. The company having the privilege to construct a branch from Bowie county through Davis and Marion counties to Jefferson, on which branch they have a like special grant of 10,240 acres of land for each mile of road. The amount of lands to which the company will be entitled on the completion of the road is 9,325,120 acres; the average value of which, with

the road constructed, could not be less than five dollars per acre, amounting to the sum of $46,625,600.

The estimated cost of the road, based upon actual construction of the grading, bridging, cross-ties, &c. of sixty-five miles, and careful instrumental surveys of the line, is $21,598,185, which cost embraces the whole railroad in the State of Texas fully completed as a first class railroad organized for business.

J. M. DANIEL,
CHIEF ENGINEER,
MEMPHIS, EL PASO AND PACIFIC RAILROAD.

COUNTY REPORTS.

BOWIE COUNTY.—*By W. E. Estes, Representative.*

COUNTY SEAT, BOSTON—at which there is a good male and female academy; also, there are other good schools throughout the county. There are also Baptist and Methodist churches. Iron ore and mineral water are found in abundance in many portions of the county, also extensive beds of lignite or brown coal. Dalby Springs, in the western portion of the county, afford abundance and great variety of water. The curative properties of these waters are well attested; the principal spring affording water of dark brandy color, 60 degrees temperature, which is not only palatable but a sovereign remedy for dyspepsia and diseases of the urinary organs. The agricultural products are cotton, corn, wheat, potatoes, etc. The climate is mild. The soil of Red river and Sulphur bottoms is very rich, while upland is apparently poor, but it is very productive. The seasons generally are sufficient to insure good crops. There is an abundance of timber of every kind, also extensive pineries. The rivers are Red river in the north and Sulphur in the south, both navigable during the spring. The Memphis, El Paso, and Pacific Railroad, graded fifty miles, runs through the entire length of this county. In consequence of the change in the system of labor, and the repeated overflows of Red river during the past spring, the yield of corn and cotton, especially the latter, will scarcely be as large by half as usual. Wood for fuel and fencing is abundant in every portion of the county. The best building material is pine. Butter, eggs, etc., are very cheap. The oak mast is frequently sufficient to fatten hogs, and it is a good hog country. Bacon can be saved in various ways. The natural increase in population since the termination of the war has been larger than for any corresponding period for the last five years. Both life and property are secure. The chief markets are Jefferson, (Marion county,) and New Orleans, the former fifty miles from our county-seat, with wagon transportation; expense small. Many of the large planters ship their produce direct to New Orleans down Red river. Freight last season from Spanish Bluff, (currency,) cotton, per bale, $15; passage to New Orleans, $40. The price of uplands (unimproved) is $1 to $3 per acre; river bottoms, $5 to $25 per acre. Product per acre, bottom-land, about one bale of cotton per acre and fifty bushels of corn. Slaves used to cultivate twenty acres—with free labor our farmers now cultivate 10, 12, and 15 acres per hand. Negroes work well in some instances. Our farmers expect to hire freedmen next year, and keep up their farms, if enactments are made compelling them to comply with their contracts. Freedmen receive good wages, are punctually paid and well treated. The useful varieties of garden vegetables are grown in this county in abundance, also fruits, apples, peaches, pears, etc. The following are the customary prices in specie: corn, 50c. per bushel; potatoes, 75c. per bushel; wheat, $1 per bushel; beef, 3½c. per pound; butter, 15c. per pound; pork, 5c. per pound; oxen, $50 per yoke; bacon, 15c. per pound; cows, $10 each; sheep, $2 50 each.

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(For Buchanan County, *see Stephens County.*)

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Cook County.—*By G. R. Reeves, Representative.*

County Seat, Gainsville.—Gainsville has the only post-office in the county. There is also one school and two churches in the town. Nearly opposite Gainsville, in the Chickasaw nation, about 22 miles northeast, and 5 miles from Red river, there are three or four oil springs, strong, rich and copious. Corn, wheat, barley, and all the cereals do well; and upon Red river there are several cotton plantations. The soil is prolific, except on the eastern side of the county, through which run the cross-timbers. Timber is fine, consisting of post-oak, ash, pecan, walnut, hackberry and elm, the best building timber being post-oak. Red river forms the northern boundary of the county. Elm fork of Trinity heads in the county, within a few miles of Red river, and runs south through the centre of the county. Upon this stream is situated the town of Gainsville. Clear creek and Jordan creek run through the county, the former on the western and the latter on the eastern side. These are fine streams, and their bottoms are both rich and well timbered. The corn crops will average this year from 40 to 50 bushels per acre, but wheat falls below the ordinary yield, in consequence of the heavy spring rains. The natural grapes of the State are abundant in the western portion and above the cross-timbers of the county. Post-oak is the best building material. Plenty of butter, cheese, milk, eggs, and poultry is easily had. Hogs breed and raise themselves upon the mast of the cross-timbers, and bacon is easily saved with proper attention. The population is gradually increasing. Life and property would be perfectly safe, were it not for the occasional raids of Indians through the county, when they steal and drive off all the horses and cattle they can collect. Jefferson, Marion county, is the market town for this and the adjoining counties, the only mode of transportation being ox-wagons. Mustang grapes are found in abundance upon the banks and bottoms of Red river, and a fine wine is produced from them. The price of unimproved lands upon Red river is from $3 to $5 per acre; improved, $8 and $10, according to the tract and improvements. Land lying off and at a distance from the river can be bought at a much lower price. There are few freedmen in the county, but there being no "*Bureau*" in the vicinity, they do as well as could be expected. Their number is falling off, owing to their emigration to Missouri. All the varieties of fruits and vegetables common to the temperate zone do well in this county.

CLAY COUNTY.—*By Hon. W. Richardson.*

COUNTY SEAT, HENRIETTA.—This county lies next above Montague, on Red river, and contains considerable bodies of fine land, and also affords fine range for cattle, horses and sheep. It is watered by Red river, Big Wichita, Little Wichita, and several smaller streams. There is considerable timber along the streams and in the northern and western portion of the county. Stockraisers commenced moving in about 1858, but have mostly left on account of the Indians. The soil is of that character calculated to produce wheat, rye, barley, cotton, hemp, etc.

COLLIN COUNTY.—*By Governor Throckmorton.*

COUNTY SEAT, MCKINNEY.—This is, perhaps, in point of soil, the richest county in the State. It is in the heart of the wheat region, and susceptible of almost entire cultivation. It may appear strange, but it is true, that all the land is fit for cultivation except the very beds of the streams. The recent registry exhibits over sixteen hundred voters. The western part of the county is high rolling prairie, as rich as Texas affords. Quite a number of streams rise in this part of the county, running a little south of east. This part of the county is rather scarce of timber. The middle portion is equally rich in point of soil, and much more abundant in timber. The eastern part is still more heavily timbered, and, except the extreme east portion, is not so susceptible of cultivation, on account of the heavy timbered ridges and bottoms. Yet the soil is very rich, with a dense growth of hackberry, elm, pecan, ash, bois d'arc, redbud, etc., on the ridges, and burr, overcup, pine, and Spanish oak, walnut, ash, elm, hackberry, pecan, wild China, etc., in the bottoms. Land is held at moderate prices; unimproved prairie, at from $4 to $5; timbered land, from $4 to $10; improved lands, from $5 to $15 per acre, governed by locality and character of improvements, those nearest the county seat commanding best figures. Corn, barley, oats, and wheat are the principal crops raised. Cotton grows well, but wheat and barley are leading products. Apples, pears, and peaches also succeed well. The spring and well-water is generally limestone. Many cisterns are in use, and made underground in the rock, with little more labor and cost than the digging of wells. The grass is good, both on the eastern and western sides of the county, but the middle part not so good. Cattle do well, but the range is better adapted for horses and sheep. Weston and Mantua, two flourishing villages in the northern part of the county, are situated about six miles apart. These places are located in the heart of populous neighborhoods, and support good schools. Plano is a thriving village, in the south part of the county, on the main stage-line from Austin to Clarksville. Farmersville is situated near the Hunt county line, and is the nearest trading point for one of the finest neighborhoods of farmers in the State. A good school is sustained there. The county seat, McKinney, suffered much during the war, all the buildings on one side of the public square having been destroyed by fire. At present there are eight dry-goods establishments, three grocery-stores, and one drug-store. One excellent school is well sustained in the town; also, one mile from town, there is a most excellent academy established since the war. There are several good steam flouring-mills in the county. I know of no county in the State that offers superior advantages to the immigrant. It is settled by a thrifty, industrious, and intelligent population—a people who have been accustomed to rely upon their own exertions, and who are determined to overcome the difficulties produced by the change in the system of labor heretofore relied upon. A long residence satisfies the writer of the exceeding healthfulness of the county. McKinney is 240 miles north from the capital of the State.

To the above, we subjoin the following additional information by *Senator Bumpass*:

This county was first settled some twenty years ago, by Collin McKinney, from whom both the county and county seat have received their name. The schools and churches of this county will compare favorably with those of any country in the world of the same age. The traveler is struck with the uniform moral deportment, quiet, industrious habits, and Christian devotion of the plain farmers of Collin. Hogs are easily raised, and every farmer has his own bacon the year round. The population is rapidly increasing, and soon the county will be densely settled. Our chief market now is Jefferson, Marion county, distant 140 miles, and reached by wagon at a cost of $2 per hundred for freight. The soil of Collin is of a black, waxy character, mingled with loam, making it easy of cultivation. It is from two to twenty feet deep, and the more it is cultivated the better it produces. The oldest farms rent the best. One hand can cultivate fifty acres of land in corn, wheat, oats, vegetables, and Hungarian grass. There are but few Africans in Collin county, and what few are left are doing very well, but are decreasing by going back to Louisiana, Missouri, and Arkansas, from whence they were driven by the war. Most of our labor is being performed by white men who own their little farms, and by steady young white men who are employed by our farmers, and are far preferable to black laborers. The following are the average prices since I have been in the State: Wheat, $1; corn, 75 cents; oats, 66 cents; barley, 50 cents; rye, 50 cents; sweet potatoes, $1; pork, 6 cents per pound; butter from 5 to 12½ cents per pound; beef, 2½ and 3 cents per pound; bacon, 12½ cents per pound; good average horses, $100; oxen, per yoke, $40; cows and calves, $12 50. The climate is delightful. We have some ice when a norther springs up in mid-winter, but little snow. Collin is bounded on the north by Grayson county, on the east by Hunt, on the south by Kaufman and Dallas, and on the west by Denton. It lies mostly above the 33d parallel of latitude, and in one of the healthiest regions of country in Texas.

DALLAS COUNTY. — *By N. M. Burford, Representative and Speaker of the House of Representatives.*

COUNTY SEAT, DALLAS.—This county was organized in 1847, and then contained a population of about 500 inhabitants. The county embraces an area of 900 square miles, and now contains a population of 12,000 whites and 1000 blacks. The land is black, sticky prairie, liberally interspersed with timber, in sufficient quantities for all agricultural and manufacturing purposes. The soil is exceedingly fertile, and when well cultivated most abundantly rewards the husbandman for his labor. Dallas, the county seat, has about 2000 inhabitants, and is increasing in population more rapidly than any town in Northern Texas. Lancaster is a flourishing village, situated 15 miles south of Dallas, and contains about 500 inhabitants. Cedar Hill, Scyene, and Breckenridge are small villages, situated in the midst of an industrious and energetic population. There are a large number of flourishing schools in the county; and Dallas has been selected by the Cumberland Presbyterians as the location for a college, to be under the control of that church. The people are industrious, moral, and religious, and take great interest in the establishment of good schools. The principal products of the county are wheat, corn, oats, rye, and barley, each of which is raised in larger quantities than in any other county in Texas, and the yield per acre equals that of any section of the Union. At Lancaster there is a foundry, where all the castings required to repair mills, reapers, and threshers are made promptly and on reasonable terms. At Dallas, Cedar Hill, and Lancaster are machine-shops, where reapers and threshers, and all other agricultural implements are manufactured as cheap as anywhere in the North, and of a better quality. Labor employed in the production of wheat, barley, and corn pays the most remunerative wages, more so than when employed in any thing else. The price of unimproved lands is from $2 to $5, and improved lands rarely sell for less than $10 per acre. The people of the county treat kindly all honest, industrious immigrants, without inquiring from what country or section they come. There are two carding factories and fifteen flour-mills, all propelled by steam, and several more in course of erection.

DAVIS COUNTY.—*By H. R. Jackson, Representative.*

COUNTY SEAT, LINDEN.—There is a high-school or academy at Douglasville, and common English schools at Linden and in all the towns and neighborhoods of the county. There are two churches in Douglasville, the Episcopal and Protestant Methodist; two also in Linden, the Episcopal Methodist and Missionary Baptist; one at Cuseata, the Missionary Baptist, and others in the different neighborhoods of the county, chiefly the Methodist, Missionary Baptists, and Presbyterians. This county is noted for its valuable minerals of iron ore and copperas springs. There are iron foundries in successful operation, and two copperas furnaces, and during the war large amounts of copperas were made for the army. The iron is of the best quality, and castings of all kinds are made from it, and the country supplied at great distances around. Considerable amounts of castings are sent to Jefferson, thence to New Orleans, and also pig-iron. The products are cotton, corn, wheat, rye, barley, rice, and tobacco; also potatoes, onions, cabbage, melons, turnips, peas, etc. Peaches, apples, pears, figs, etc., are also raised. The climate is pleasant and very uniform. Northers are very rare. In winter frosts are common, but ice and snow very rare. The seasons are favorable to agriculture; crops rarely suffer either from droughts or excess of rain. The soil is sandy loam of a dark reddish and sometimes of a whitish color, and very productive. Not more than one-fourth of the county is untillable. The whole county is heavily timbered with oak, hickory, sweet gum, black-jack, and pine. The only river is Sulphur, with John's and James' creeks. The present crops are about the average, but cotton promises to be over an average this year. This county is strictly agricultural, and no stock is raised beyond what the farmers need for their own use. The building materials are pine and oak timber, usually worth about $1 per 100 feet. There are three saw-mills run by steam, and two steam flour-mills. The county produces every thing necessary for living, in abundance and cheap. The white population is increasing, but the black population is decreasing very fast, by roaming about, and many of them dying for want of the care to which they have been accustomed. The market is Jefferson, Marion county, which is reached by wagons at a cost of about $2.50 per bale for cotton, and from Jefferson to New Orleans by steamers, the cost is about $3 per bale. The vine grows in abundance wild, and produces a most excellent grape which makes a very fine wine. This grape is usually called the scrub-grape, the vine running upon the bushes and scrubby black-jack growth. The wine is only made as yet for home consumption. It would probably be found a very superior grape by improvement. Lands are worth from $2 to $3 per acre, $5 being about the price of improved land, which, before the war, was worth $10. The price is now advancing. The product per acre of cotton is 600 to 1200 pounds in seed; corn, 10 to 25 bushels; wheat, 8 to 12 bushels; rye, the same; barley, 20 to 30 bushels; rice, 20 to 30 bushels. The rice is grown on the low, rich bottom-lands, and is generally raised for home consumption. About 20 acres in corn and cotton has been the usual amount cultivated by each hand, but the freedmen do not now cultivate over 12 to 15 acres each. Some of the planters are employing white laborers, chiefly refugees from other States. They do more work than the freedmen, and fully as much as the slaves formerly did, and with far less trouble to the employer. They are paid from $10 to $15 per month. The voting population is about 1000, and the white population about 5000 or 6000. The negroes far exceeded the whites in numbers before emancipation, but it is impossible now to tell their number.

DENTON COUNTY.—*By W. A. Kendall, Representative.*

COUNTY SEAT, DENTON.—Denton county has about one thousand voters. There are six schools. There are at this present time but few churches or high-schools, but in these respects Denton will compare favorably with any of the western counties.

There are some fine, flourishing mills; the most importan are at Pilot Point, Okalla, and Rollin. The lands of the county are rich and productive. There is in the county a variety of soils—black loam, sandy, and mulatto. The products are corn, wheat, oats, peas, Hungarian grass, millet, sweet potatoes, pumpkins, watermelons, sorghum, etc. The principal streams running through the county are the Elm fork of the Trinity, Clear creek, Hickory and Denton creeks, all of which are well timbered. The principal growth is burr-oak, Spanish oak, and pecan, besides the lower cross-timbers running parallel with the eastern line of the county, making as fine a hog range as there is in any portion of the State. There are large quantities of bacon saved every year. The cross-timbers are interspersed with beautiful prairies, on which there are some fine farms. They raise fine vegetables of all kinds, fruits, grapes, etc. The prairie lands of the county are clothed with as fine grass as any lands in the State, and stock-raising is extensively and profitably carried on here. Horses, cattle, sheep, and goats are to be seen in great numbers. There are not a great many negroes in the county. They are generally employed by their old masters, at wages from ten to fifteen dollars per month. They are respectful, contented, and healthy, knowing nothing of the workings of the Freedmen's Bureau; nor do they desire to know, feeling competent to make their own contracts. The price of land varies from two to ten dollars per acre, in proportion to convenience to timber and water. Our nearest market, at present, is Jefferson, distant about one hundred and seventy-five miles; transportation by wagon. We also have a home market. There is generally a stream of immigrants passing through and settling in our county, which gives us a fair market for our products. The price of wheat at present is $1.25 per bushel; corn, 50 cts. The product of corn per acre is thirty to forty bushels; of wheat, twenty bushels; of oats, fifty bushels.

El Paso. — *Furnished by the El Paso representative, Hon. Gregorio N. Garcia.*

Franklin is the only post-office. This town is opposite El Paso, Mexico, and is often called El Paso, Texas, the two towns being only separated by the river. In Franklin there are three Spanish schools and three Catholic churches. There are supposed to be valuable mines of gold and silver in this county, but they have not been explored. There is a silver mine 24 miles from the town of San Elizario, called La Mina del Padre, and the mountains around are believed to contain gold, silver, and lead. 80 miles east of San Elizario are several salt lakes, furnishing the best salt known. It is used by the United States troops at Fort Bliss, and formerly by those at the posts in New Mexico. Large quantities are sent into Chihuahua, Mexico, and constitute the chief trade with that State. Corn, wheat, and beans are the chief products, but cotton could, doubtless, be very profitably raised for the market in Mexico. The chief markets are Santa Fe, (New Mexico,) Chihuahua, and San Antonio. Distance to San Antonio, 700 miles, and cost of transportation 10 cents per pound, specie. Distance to Chihuahua, (Mexico) 300 miles, and cost of transportation 3 cents per pound, specie. Good irrigable land in El Paso sells at $3 per acre. The Mexicans carry on farming in their own awkward style, seeming incapable of adopting the American improvements in agricultural implements, however obvious their advantages. But the great value of the bottom-lands on this side of the Rio Grande, and their susceptibility of irrigation for 100 miles by a single canal, taking the water from the river just above El Paso, is now attracting attention. Such an improvement would make a paradise in this remote western county of Texas. Vegetables of all kinds are grown in El Paso, and they are admitted to be superior in size and quality to those in other parts of Texas. The El Paso onion is quite celebrated. Wine is made as a principal article for market; other fruits are also grown, such as apples, pears, peaches, plums, apricots, quinces, figs, etc., all of the finest flavor. Corn is usually worth $6 per *fanega*, (2½ bushels;) wheat, the same; potatoes, $2 per *arroba*, (25 lbs.;) beef, 12½ cents per lb.; butter, $1 per lb.; oxen, $25 per head; cows, $20; sheep, $2.50.

FANNIN COUNTY.—*By W. C. Whitsett, Representative.*

COUNTY SEAT, BONHAM.—There is one female seminary in Bonham, in a flourishing condition. There are two churches in Bonham, and one in almost every neighborhood in the county. Agricultural products are varied, as corn, wheat, oats, barley, tobacco, and cotton. Hemp on the river does very well. The grain crop this season is not over half of an average, and there is but little cotton, tobacco, or hemp raised. The climate is mild and healthy, and the soil rich as heart could wish, but some years too dry, and this year decidedly too wet. There is an abundance of wood for fuel and fencing. The best material for building is stone, of which there are large quarries. Living is moderately cheap; butter, 10c. per lb.; eggs, 10c. per doz.; poultry, milk, and cheese in proportion. Hogs are easily raised, and bacon as easily saved as in Kentucky. Our population is on the increase, but at what rate I am not informed. Life and property are quite secure. Jefferson, Texas, is our chief market; distance, 150 miles; price of freight, from $1 to $2.50 per 100 lbs., by ox or mule wagons. Improved lands are worth from $2.50 to $10 per acre. Our freedmen work tolerably well, and, with a few exceptions, behave well. I do not think their numbers will increase, left as they now are to themselves. As a general thing, I think our farmers and planters will make contracts with the freedmen, and continue their agricultural pursuits, but on a smaller scale. Vegetables are easily raised, and in great variety, such as cabbage, onions, turnips, potatoes, beans, peas, tomatoes, etc. Peaches are very plenty, plums and apples also. The customary price of corn per bushel is 50c.; wheat, $1; barley, 50c.; potatoes, 50c.; beef, 3c. per lb.; and bacon from 10c. to 15c. Horses are worth about $65; oxen, $45; cows and calves, from $10 to $15; sheep, $2.50 to $3 per head. [To the above we subjoin extracts, giving additional information, from an article kindly furnished by Mr. W. A. Evans, of Bonham.] Our soil is mixed; a large portion of the county is black, waxy soil, very rich and productive; this applies to the southern portion of the county; the northern portion is more inclined to be sandy, or in other words, there is a space of country extending through the entire county, from east to west, about 15 miles in width, that is what we call wire-grass or sandy land; this land is productive of small grain (wheat, oats, and barley) and produces corn, but not so well as the black lands; this belt of land lies between the Red river bottoms and the black lands of the southern part of the county. Red river, which is the northern boundary of the county, has wide, rich bottoms, which, for fertility of soil, are unsurpassed by any lands in the Mississippi valley; the character of this soil is a rich red deposit, generally with a sufficiency of sand mixed with it to make it easy of cultivation. In this country we generally have a sufficiency of rain during the spring and summer to make good crops. There is generally a dry spell of from four to six weeks, commencing about the 16th of June and continuing until the middle of July or 1st of August. For the last two years, however, we have had no drought whatever. The spring months, from 1st of April until 10th of June, are very mild and pleasant, with good, bracing Gulf breezes. From about 10th June until 15th August the weather is very warm, but not so oppressive as the same time of year is in the States of the latitude of Kentucky, Virginia, and Missouri. The nights in summer are generally very pleasant. Red river is the only river; it is sometimes navigable this far up. We have no railroads. The contemplated Memphis, El Paso and Pacific Railroad has been surveyed, to pass through the central portion of this county. The raising of stock is not so extensively carried on here as in the counties west of this. Sheep do well, and there is abundance of pasturage sufficient for the successful raising of sheep; no food is required to be given them in winter. Tobacco is grown to some extent, and on the river and creek lands does well. Hemp has been raised on Red river successfully, and does well, though no person is raising any now. Our best building material is brick, and a white rock that is easily worked. An ax, a saw, and jack-plane will work it, as there is no grit in it. It is fine for all building purposes. Our pine lumber we have to haul some 60 or 70 miles; other lumber can be obtained at home. Our population is increasing, from immigration, at about the rate of ten per cent. per annum. Some few persons have commenced growing the domestic grape. Samuel J. Galbraith, our county clerk, has paid of late considerable attention to this branch of the business, and has succeeded in producing fine grapes of different varieties. His experiments have been so satisfactory that he is now planting an extensive vineyard. Cotton will yield near one bale to the acre. Corn, in the uplands, from 25 to 40 bushels to the acre, on the bottom-lands will yield 50 bushels per acre. Wheat will yield on an average 15 bushels per acre, some say 25. Barley will yield from 40 to 60 bushels per acre. One hand can cultivate ten acres in corn, five in cotton, and ten in wheat, or, if you leave out the cotton, can cultivate ten acres in corn, ten in wheat, and ten in barley and oats. Our reaping in this prairie country can be and is all done with horse-power reapers.

GRAYSON COUNTY.—*By W. Holford and G. R. Reeves, Representatives.*

COUNTY SEAT, SHERMAN, which is a small town, with two churches, and one fine school established and supported by the Odd Fellows. Schools and churches are found in various parts of the county. The chief agricultural productions are cotton, corn, wheat, rye, oats and barley; but all other grains, together with grasses of various kinds, and all sorts of vegetables, are raised for home consumption to any extent desired. As Grayson borders on Red River, it has some of the finest cotton lands, which often yield 1 bale to the acre. The yield of other products to the acre average 25 or 40 bushels of corn, 18 to 25 bushels of wheat, 50 bushels of oats, and 40 to 60 bushels of barley. The climate is changeable in winter, the coldest weather being often attended with ice and snow, continuing on the ground six or eight days at a time. The balance of the year, the climate is pleasant and salubrious. The seasons are favorable to agriculture, the droughts seldom being of such long continuance as to seriously injure crops. Hence, the farmer relies with much confidence upon having a profitable return for his labors. There is a variety of soil, such as the sandy, red, black, and black waxy, all of which is rich and produces well. There is comparatively very little untillable land in Grayson county. Timber is abundant and good, as a considerable part of the county is covered with it, and therefore building and fencing material is plenty and cheap, and fuel can be had for the labor of hauling. This county is bounded on the north by Red River, which separates it from the Indian Nation. There are various small streams in the county, which empty into Red River. There is very good pasturage, and though stock-raising is not pursued as an exclusive business, yet every man has as much stock and as many sheep as he has any need for, at scarcely any expense. Milk, butter, cheese, poultry, eggs, etc., are abundant and cheap. Hogs are easily raised, and almost without cost, on the wild mast. Bacon is cured without difficulty. The population of Grayson is steadily increasing. Jefferson is the market at which the people purchase all they need beyond what they produce at home. Immimigrants to the county and the friendly Indians from the Nation are the principal purchasers of all the surplus products. Jefferson is 160 miles distant, and the cost of hauling to or from there is usually $2 per 100 pounds. The Mustang and post-oak grape grow wild, and wine is made in small quantities. The climate and soil are undoubtedly well adapted to the vine. Unimproved land is worth from $2 to $10 per acre, and improved from $5 to $25. A hand can easily cultivate 50 or 60 acres in wheat, corn, barley and oats. The negroes do tolerably well. There have been few, if any, federal officers or troops in this county. The number of negroes has diminished, by their leaving the county and going north. The farmers and their sons work, but there are very few white laborers to be hired. We think the negroes will be contracted with to work another year. Vegetables of all kinds are easily raised, and such fruits as peaches, apples, pears, plums, etc. Corn usually sells at 75c. per bushel; wheat, $1 per bushel; barley, 50c. per bushel; potatoes, 75c. per bushel; beef, 3c. per pound; bacon, 15c. per pound; horses, $100 to $150; oxen, $50 per yoke; a cow and calf, $15, etc. There is not, probably, more than about one negro to six white men in the county. The Choctaw, Chickasaw and Cherokee Indians are in the habit of crossing over Red River and bringing ponies and cows and calves to trade with; they also bring some money. Ice is usual every winter, and the snow falls sometimes to the depth of six or eight inches, but does not continue long, and cattle and sheep always find all the shelter they need and their food in the timbered bottoms. The larger part of Grayson is prairie. The water is generally abundant; in the sandy lands it is soft, but in the black waxy land, limestone. The negroes work but little—have no regard for their contracts; their numbers are daily becoming less, by leaving the county and dying off. White laborers perform about twice the work of negroes.

HOPKINS COUNTY.—*By L. G. Harman, Representative.*

COUNTY SEAT, TARRANT.—There is a male and female school in Tarrant, and a male and female school in Sulphur Springs. The products of the county are corn, wheat, oats, barley, rye, buckwheat, tobacco, cotton and sweet and Irish potatoes. The climate is mild and the soil good. Seasons in general are also good, and droughts not common. Timber is abundant, such as white, red and post-oak, walnut, sassafras, hackberry, hickory, pecan, ash, bois d'arc. The Sulphur fork of Red river runs through the north part of the county. White Oak creek runs through the centre of the county, from west to east. Rock creek and Elm, Burk's, Gurrett's, and Turkey creek run into the Sabine.

The crop of the present year is rather light; the usual average is about 30 bushels corn, and of wheat 20 bushels per acre. Living is cheap. Butter, milk, cheese, eggs and poultry are abundant. Hogs are easily raised and bacon is made of the best quality. Jefferson is the chief market, and is reached by wagon, distance 80 miles, at a cost of about $1 per 100 lbs. Lands are about $2 to $5 per acre. Hands cultivate about 15 acres each in corn and cotton. Vegetables of every variety are easily raised, and are abundant. Peaches are of the finest quality and in abundance. Also there are a few good apple-orchards in the county. Cistern-water is most generally used, though there are some good springs. The vote is about 1200 and population 6000, all told. The Memphis, El Paso and Pacific Railroad will run about 30 miles north of Tarrant. There are large herds of sheep which do well. No feed is required in winter, as the range is good. There are stocks of horses and cattle for market. Some persons are engaged in cultivating the grape with encouraging prospects of success. The negroes constitute about one-fourth of the population. They behave very well, but work reluctantly. Much the larger part of the labor is performed by the farmers and their sons. Corn, 75 cents; Wheat, $1; rye, $1; butter, 10 cents; eggs, 10 cents per dozen; bacon 12½ cents; very superior pork, 4 to 5 cents; beef, 3 cents; horses, $50 to $60; oxen, $40 to $50; cow and calf, $10; sheep, $1.50 to $2.

Hunt County.—*By H. B. Simonds.*

County Seat, Greenville.—We have the Greenville male and female academy, Mount Carmel male and female academy, with several good primary schools in different parts of the county. The agricultural products are corn, wheat, oats, barley, Hungarian and millet grasses, Irish and sweet potatoes, rye, castor-oil bean, tobacco and cotton. The climate is mild, and the northers usual to Texas not very severe. The soil is good; about half the county is heavy black land; and the balance black, sandy land. The county is well timbered with oak, ash, walnut, hackberry, hickory, etc.; no pine. The Caddo and Cowleach forks of the Sabine river, and the Sulphur, all head in this county, but we have no navigable streams or railroads. The crops are all light this year, owing to extreme wet weather in the spring and fore part of the summer. The pasturage is excellent. The stock principally raised are cattle, horses and sheep. We have plenty of wood for fuel and fencing. Wood and brick are our building material. Living is very cheap; milk, butter, eggs and poultry are abundant. We have good range for hogs, and have no difficulty in saving bacon. Our population is increased within the last year about 15 per cent. Life and property have been very secure since the war. We have never had troops stationed in our county, either Confederate or Federal. Our chief market is Jefferson, Texas, and we reach it by ox-wagons, at an expense of about $1.50 per 100 pounds. The price of wild land is from $4 to $5 per acre; and improved the same, with about the price of improvements added. We raise about 1000 pounds seed-cotton to the acre on the uplands, 30 to 50 bushels of corn, and from 10 to 20 bushels of wheat. A hand can cultivate about 20 acres in cotton, or 30 to 40 in corn and wheat. Our negroes do not work well since they were emancipated. Their general behavior is very good, and their numbers have rapidly declined since the war. We have no white laborers to speak of, except those cultivating their own land, or otherwise laboring for themselves. They do at least three or four times the labor of freedmen. Our farmers will not employ the freedmen to any great extent next year. Vegetables are not abundant, nor very easily raised as a general thing, except where the land can be irrigated. We raise peaches, pears, apples, plums, cherries and some grapes. Wheat is worth $1; corn, rye, barley and potatoes, about $1. Beef, 2½ cents gross; pork, $6 per hundred. Horses, from $30 to $100; beef cattle, $15 to $20 per head; oxen, from $30 to $60 per yoke; cows, $12; sheep, $2.50. There are several meeting-houses in the county, namely, Methodists, Baptists, Presbyterian, (Cumberland,) and Christians. The population of Hunt county is over 9000.

JACK COUNTY.—*By Judge T. W. Williams.*

COUNTY SEAT, JACKBORO.—This county, situated on the headwaters of the west fork of Trinity, is mostly in the upper cross-timbers, and presents quite a variety of soil as well as surface. It contains some fine lands, suitable generally for small farms, with good range and outlets for stock. The county seat is situated in the geographical centre of the county, but is not considered a suitable locality. There is abundance of timber in most parts of the county. It is but partially settled.

JOHNSON COUNTY.—*By W. R. Shannon, Representative.*

COUNTY SEAT, BUCHANAN.—There is in the county one college and several schools of considerable respectability. The area of the county is 900 square miles. It is situated on both sides of the Brazos river. Soil, for fertility, unsurpassed by any county in the State. Timber, water, and limestone, for building purposes, are in abundance. The productions are corn, wheat, barley, rye, oats. Cotton is only produced in a limited amount, in consequence of the scarcity of labor. Horses, cattle, sheep and hogs are raised in great numbers. All kinds of stock winter well with feed. Transportation from Buchanan to Millican carried on exclusively by means of wagons. There are in the western portion of the county two of the finest white sulphur springs in the State. White population, about 4,000; black population, about 1,500; freedmen doing but little good.

JONES COUNTY—(*Unorganized.*)

Situated on the headwaters of Elm fork and Point Creek, tributaries of the Clear fork of the Brazos, is almost a continuous mesquite valley, thickly covered with a fine growth of mesquite timber. The soil appears fertile, and is of a reddish color, and gives to the water a tinge of the same hue. Grass fine and game abundant.

LAMAR COUNTY.—*By D. H. Davis and L. G. Harman, Representatives.*

COUNTY SEAT, PARIS, with a popoulation of 1,500—no other post-office in the county. There are a number of prosperous schools in this county, namely, Shilo (male and female) Academy, six miles west from Paris, also Spring Hill (male and female) Academy, 13 miles northeast from Paris, both in a flourishing condition. There are also several fine common schools and three fine churches in Paris, namely, Baptist, Methodist, and Presbyterian, and a number of churches throughout the county. The agricultural products are cotton, corn, wheat, rye, barley, oats and tobacco. Climate mild. Soil in most parts very productive. Timber generally very abundant, such as post-oak, red oak, black, Spanish, overcup and white oak, hickory, ash, pecan, hackberry, bois d'arc, and various other timbers. Red river bounds it on the north, and Sulphur fork of Red river runs through the south part of the county. The principal creeks are

Pine creek and Saunders creek in the north part of the county, emptying into Red river. A number of large creeks are in the south part of the county, and empty into North Sulphur. Lamar has no railroad, but the Memphis, El Paso & Pacific R. R. has been surveyed through Lamar county from east to west, and it is thought will be in operation in a few years. The corn crop of the present year will be only moderate; wheat crop very light. The usual average of corn is about 35 bushels per acre, wheat 20 bushels. Sheep do well. For building purposes we have an abundance of pine lumber in Red river county, from 12 to 20 miles, at $1 50 per hundred. People live easy and comfortable. Butter, milk, eggs and poultry are cheap and plenty the year round. Hogs are raised in abundance, and cheap. Bacon can be saved as well as in any place in the world. Population is rapidly increasing. Our principal market at present is Jefferson, distance 100 miles—has to be reached by wagons, at about $1 50 per hundred. The vine is grown with success; the Catawba, Isabella, and other cultivated grapes are raised, and wine is made of a good quality. Lands are cheap, say from $2 to $5 per acre for uncultivated. Vegetables are abundant, such as Irish and sweet potatoes, cabbages, turnips, and in fact every variety usually grown. In the north portion of the county fruits are abundant, such as apples, peaches and pears. The north portion of the county being sandy soil is better adapted to fruit than the southern portion, which is black land, not so good for fruit. About half the county is covered with timber, balance prairie and brush lands. There are some springs of good water in the northern portion. Good wells can be had in Paris and vicinity, from 25 to 60 feet. Cisterns are very common. Stock water is abundant. The vote of the county is about 1,500. The negroes constitute about one-third of the population. Their numbers are slowly diminishing since emancipation. Most of them work for one-third the crop, every thing found. Wages, about $10 per month. They behave very well, but are not to be depended on for work. Wheat and cotton are the chief products for market.

MARION COUNTY.—*By W. P. Saufley, Senator.*

COUNTY SEAT, JEFFERSON.—Marion county is bounded on the south by Big Cypress bayou, Ferry and Caddo lakes, on the east by Clear lake, and on the west by Big Cypress bayou. The climate is the most delightful in the world, the average range of the thermometer during the summer being about 80°; and refreshing breezes from the south blow almost without interruption. The winters are very mild, and there is seldom snow or ice. The soil of this county is not as rich generally as many others. The bayou, creek bottoms, and lands upon the lakes are equal to any other lands in the State, producing, on an average, from 1000 to 1500 lbs. cotton to the acre, and the uplands from 600 to 800 lbs. to the acre. Tobacco grows well in this county, and will at some future day become an article of commerce and export. The planters generally raise an abundance of corn, the average crop being from 20 to 25 bushels to the acre. The lands are not well adapted to wheat, and the average is not more than 10 to 12 bushels per acre. Other small grains, such as rye, oats, and barley, yield plentiful crops to the farmer. For stock-raising, we depend principally upon feeding and pasturage. The farmers generally raise their own hogs, and have no difficulty in making as good bacon as ever was put up in Ohio or Kentucky. As to cheapness and comfort of living, we have butter, milk, eggs, and poultry in abundance. This county has a great variety of timber, such as pine, oak, ash, walnut, hickory, mulberry, cedar, cypress, and other forest-trees. Our best building material is pine and cypress. We have several saw-mills, and many others in process of erection. Grape and mulberry abound here; they are indigenous to the soil, and grow luxuriantly, indicating that wine and silk, as well as cotton and tobacco, will one day become staples of the county. Iron ore is found in this county in great abundance; the ore will yield upward of 75 per cent. One foundry, known as Nash's Iron Works, has been worked before and during the war, with great success. Leeds, and other iron men of New Orleans, have worked and tested this iron, and pronounce it equal to any in the world for toughness and malleability. The quantity is equal to all the demands of Texas for hundreds of years to come. The hills in which this ore abounds are covered with dense forests of pine and other timber, useful as fuel in the furnaces. Lead, copperas, and copper are also found in considerable quantities. Many other sources of wealth and enjoyment are found here, and will, in all good time, be realized by her citizens. Fruits of all kinds grow well here, and of the rarest and richest kinds; the peach is unrivalled, and nowhere is it of larger growth or richer flavor; the nectarine, quince, and grape are equally luxuriant; the fig, a delicious fruit, is very common, and may be raised in the greatest abundance. A great variety of berries, such as the mulberry, dewberry, whortleberry, strawberry, and gooseberry, grow wild in the greatest profusion. The chincapin, walnut, and hickory nuts are very abundant. The deer are still very plentiful, hence venison is very common and very cheap. Besides deer, wild turkeys are very numerous, and generally fat. Large and almost innumerable flocks of wild geese, brants, mallard and common ducks, and other water-fowl frequent the bayous and lakes, and are so plentiful that a hunter can alway furnish himself with as many of them as he desires. Partridges, pigeons, snipes, and rice-birds are very plentiful. Fish of almost every character are in great abundance in the lakes and bayous. There are many mineral springs, some of which are places of much resort, and are highly appreciated for their medicinal virtues. The population is as good as you will find in any country, and life and property are perfectly secure. The citizens are mostly from the States of Alabama, Georgia, Mississippi, Kentucky, and Tennessee. Much interest is taken in education. There are good schools all over the county, and religious worship is much respected. Churches are very common. No person is molested on account of his religious opinions, but allowed to worship God according to the dictates of his own conscience. One railroad is in a fair way of construction from the city of Jefferson to the northern and north-western counties; it is called the Memphis and El Paso Railroad. Jefferson is situated at the head of navigation on Big Cypress bayou, a navigable stream for second-class steamers, upon an average of seven months in the year—sufficient to get off all the products of the country. The population of Jefferson is about 4000, and it is the commercial point for about twenty counties north and north-west of it, which comprise nearly all of north-eastern Texas, the most populous and wealthy portion of the State. Our chief market is New Orleans, about 500 miles from Jefferson by water. Jefferson, in commercial importance, is the first city in eastern Texas. It is 50 miles north-west of Shreveport, and has been her successful rival in cutting off all the trade of north-eastern Texas which formerly went there. Cotton shipments usually from Jefferson amount to from 75,000 to 100,000 bales. Wool, hides, peltries, and bois d'arc seed are very considerable items of commerce, and are shipped from this point in vast quantities. Jefferson is improving rapidly. Many large and splendid brick buildings are now in process of erection, mostly intended for business houses. Capital is concentrating at this point, where there are now many large wholesale dry-goods and grocery houses. Goods of all descriptions are sold at as low rates as in any city in Texas. Freights before the war were very moderate—on a bale of cotton to New Orleans, $1.50 to $2; up freights, 75 cts. to $1 per barrel. Since the war, freights are higher, on account of the scarcity of boats; but by the time trade opens again, every thing will open up as usual. Jefferson has good society. It contains three churches, and there are others in process of erection; two good schools, male and female, not surpassed by any in the State. Lands are worth from $1 to $5 per acre, and one hand can cultivate easily from 12 to 15 acres. The negroes have done much better than was anticipated after emancipation. The crops this year will be a fair average. The average price of corn, wheat, rye, and barley is about $1 per bushel; potatoes, 50c.; beef, 3½c. per lb.; pork, 6 and 8 cts.; butter, 30 cts.; and bacon, 20 and 25 cts. per lb.

PALO PINTO COUNTY.—*By Jesse Mercer, Representative.*

COUNTY SEAT, PALO PINTO.—This county is principally devoted to stock-raising, and is mostly prairie. The Palo Pinto river runs the body of the county. Soil fertile. Coal and other minerals abound.

PARKER COUNTY.—*By Charles L. Jordan, Representative.*

COUNTY SEAT, WEATHERFORD.—Veal Station is a small town in the northeast corner of the county, at which place there is a fine female seminary. Common schools are numerous in the county, and are well patronized. There are no regular churches, yet every denomination has a fair representation. Corn, wheat, rye, barley and oats are the principal products of the county. Experiments have been made in regard to raising tobacco, which have resulted very favorably, the article produced being heavy, and resembling the weed raised in Virginia. Cotton is raised in sufficient quantities to supply home consumption. Climate is mild. The soil is of two kinds—the sandy loam and black land. The first kind, well cultivated, produces the best crops of corn, while the latter produces more wheat. Our wheat land produces generally 25 bushels per acre; the corn land about 15 to 18 bushels. Nearly one-half of our land is timbered, the timber being suitable for fencing and rough houses. Building material consists of brick and rock. This county ranks second to none in the State for water. The Brazos river runs through the county, and quite a number of the tributaries of the Trinity river head in this county; fine springs abound almost everywhere, and good wells can be had at about 22 feet deep, at which depth we generally find a white sandstone rock. The prospect for crops the present year are, for corn, very fine; for wheat, medium. Our wheat will be cut short on account of too much rain when it was in bloom. Living is as cheap as in any other section of the south. Pork can be raised for a mere trifle, and we have no trouble in curing or saving bacon. Our chief market is Millican; distance, 190 miles. We use ox-teams for transportation. The price for freighting is $2 per 100 pounds. The grape-vine grows well here; but few experiments as yet in making wine. Land is worth from $1 to $10 per acre, according to quality. One hand can cultivate 40 acres of land in corn and wheat. The negroes do not work as well as formerly; generally lazy, and in fact very unreliable; show a great disposition to get to the towns. Some of our farmers will contract with the negroes next year. We raise nearly all kinds of vegetables. Peaches grow here in abundance; a few cherries and apples. Corn is generally worth 75c. per bushel; wheat, 75c. per bushel; potatoes, $1 per bushel; beef, 3c. per pound; pork, 6c. per pound; butter, 8c. to 10c. per pound; bacon, 10c. to 12c. per pound; horses, from $25 to $125; work oxen, $40; cows and calves for milk, $12; sheep, $2 50.

RED RIVER COUNTY.—*By William H. Hooks, Representative.*

COUNTY SEAT, CLARKSVILLE.—We have a number of good schools and churches throughout the county. McKinzie's College, 3 miles southwest of Clarksville, is a fine institution of learning, and in successful operation. The agricultural products are corn, cotton, wheat, oats, barley, rye, potatoes, peas, and all kinds of vegetables. Climate mild and pleasant. We have a variety of soil—prairie, river-bottom and timbered land. The prairie lands are black and of the richest quality; the river-lands are rich and productive, and have not been overflowed entirely since 1842. They came nearer overflowing this last spring than they have since that time. The timbered uplands are sandy, and some portions are productive. It is a fine country for fruits, vegetables and grapes. Some fine pineries are in the timbered lands, which keep some 6 or 8 steam saw-mills in active operation all the time. The lumber sent from this portion of the county is a source of considerable profit. Red river is the northern boundary of the county, and Sulphur the southern. The Memphis and El Paso Railroad will run through the centre of the county. The grading is completed through a portion of the county. We have hardly an average prospect for a crop this year, but will make enough grain to do us, and some to spare. We have plenty of timber for all purposes. Our best building material is pine lumber. We have plenty of butter, eggs, milk, cheese, poultry, etc. It does not cost much to raise hogs; they generally live on the range until they are two years old; they are then put up and fattened on corn a few weeks. No trouble about saving bacon. We are secure in life and property, and our population is increasing rapidly. New Orleans and Jefferson are our markets. We ship down Red river direct to New Orleans, when the river will permit, at a cost from $2 to $3 per barrel. When we haul to Jefferson, distance 100 miles, we pay $1 50 to $2 per 100 pounds for hauling. We make no wine, though I think it could be made. Lands are worth from $1 to $10 per acre. We make from 1,200 to 2,000 pounds of seed cotton per acre; from 30 to 50 bushels corn; wheat, from 15 to 25 bushels. A hand can cultivate from 15 to 20 acres in corn and cotton; in corn and wheat he can cultivate more. The negroes do about half work since their liberation, their behavior is good; we have some white laborers, and they are considered better and more reliable. I think it is the calculations of the farmers to carry on their farms another year with the freedmen, if they can do no better, though some of them speak of quitting altogether. The customary price of corn is 50 cents to $1; wheat, the same; potatoes, $1; pork, 5 cents per pound; butter, 10 cents per pound; bacon, 12½ cents per pound; oxen, $40 to $50 per yoke; milch cows, $10 per head, with calf; sheep, from $1 to $2 per head.

STEPHENS COUNTY—FORMERLY BUCHANAN.—(*Unorganized.*)

This county, lying south of Young, contains some of the finest lands in north-western Texas. The valleys on Hubbard's creek are never forgotten by one who sees them. Level almost as a billiard-table, and covered with the finest of mesquite grass, which remains green nearly all winter, it would be difficult to find any thing more beautiful and picturesque. East Hubbard's creek and its tributaries water the western and middle portions of the county. The east portion of the county is diversified with hills and valleys, with some fine running branches. The greater portion of the land was located and surveyed by the Texan Emigration and Land Company, or for the State University and Asylum Lands. The most of the settlers in this county are stock-raisers, squatted upon these Company and State lands.

SHACKLEFORD COUNTY—(*Unorganized.*)

Is immediately west of Stephens, formerly Buchanan county, and presents nearly the same features. It is the best watered county in the upper Brazos country. West Hubbard's creek and its tributaries, Mill, Jennie's, and several other creeks run in different directions through it. The old Government road from Camp Colorado to Camp Casper passes through the eastern portion. The county is but little settled. Soil fertile. Coal and minerals show themselves in many places.

TARRANT COUNTY.—*By W. B. Tucker, County Judge.*

COUNTY SEAT, FORT WORTH.—At Fort Worth we have one male and female academy, and the Rural Academy at Cross Timbers, 14 miles east from Fort Worth, also the Mansfield Academy on the edge of the Cross Timbers. There are, besides, various other schools in the county. Our churches are the Methodist, Presbyterian, Christian, and Baptist. We have two masonic lodges—one at Fort Worth, and one at Grape Vine prairie. Our agricultural products average about as follows: Wheat, 20 to 30 bushels per acre; corn, 40 bushels; rye, 35 bushels; oats, 30 bushels; Hungarian grass, 2 tons per acre; cotton, 1 bale to the acre; barley, 40 to 60 bushels to the acre. We also raise rice, potatoes, tobacco, etc. The Cross Timbers abound with iron ore, also petroleum oil. Quicksilver mines have been discovered, but not yet worked. We have several springs in the county possessing medicinal properties. Our climate is mild, thermometer ranging from 50 to 80 in winter, and from 80 to 100 in summer, with pleasant breezes. The summer nights are perfectly cool and delightful. Our soil is generally good black prairie, but in the Cross Timbers we have the red and sandy land. Our seasons are good, as may be seen by our products. We have timber in abundance for all necessary purposes. The Trinity river runs through the centre of the county, skirted with fine timber, and it has various tributaries, thus affording lasting water with fine timber all through the county. We have no railroads at present, but some projected lines are intended to run through the county. The prairies afford excellent pasturage, and fine fat beef can be had in winter from the range. Our building material is limestone, rock, brick, concrete, with a sufficient amount of timber to answer all building purposes. Milk, butter, cheese, eggs, poultry, and spring and winter vegetables can be had the year round. Bacon is excellent, and the cost of living is comparatively nothing. Hogs can be raised at but little cost beyond saving the bacon, which is not much more trouble than in the colder States. Our population is increasing at about the rate of 5 per cent. per annum. The county is perfectly secure from the Indians. The vote was 700 before the war, and is now 1000. Our markets are Houston and Galveston, via Millican, which is about 200 miles; freight, from $1 to $1.50; also, San Antonio, Paris, and Jefferson, in Texas, and Shreveport, in Louisiana. No attention as yet has been given to horticulture, though the grape grows luxuriantly and spontaneously, from which much fine wine is made. The prices of improved land range from $3 to $15; unimproved, from 50 cents to $1.50 per acre. The negroes are orderly, but only work tolerably well. Their number has decreased 50 per cent. since the war. Our farmers do not expect to make contracts with negroes, but to work their usual crops themselves. We have peaches in abundance, and some apples, but not much attention is given them. Corn is worth 50 cents; wheat, from 50 cents to $1; rye, 50 cents; barley, 40 cents; potatoes, 50 cents per bushel; beef, from 1 to 3 cents per pound; pork, about 4 cents; butter, 8 to 12½ cents; bacon, from 10 to 12½ cents; horses, $30 to $150; oxen, $30 to $50; cows, $8 to $10; stock cattle, $4 per head; sheep, $2 per head.

Titus County.—*By William Hart, Representative.*

County Seat, Mount Pleasant.—Titus county is situated in the north-east corner of the State. It is the second county, both from the Arkansas and Louisiana line. It is bounded on the north by Red River county, on the east by Bowie, Davis and Marion, on the south by Upshur, and west by Hopkins. It is situated in latitude 33 degrees, on the dividing ridge between the Sulphur fork of Red river and a stream called Big Cypress. The land is an alluvial yellow, sandy soil, generally deep and productive, covered with fine timbers, consisting of oak, hickory, post-oak, etc., on the hills; lynn, sweet-gum, birch, sycamore, elm, and dogwood in the bottoms. When properly cultivated, the average yield of corn is from 15 to 35 bushels, and is from 1000 to 1500 pounds of seed-cotton per acre. Though small grain can be grown profitably, there was, previous to the war, very little grown, from the fact that they could purchase small grain from the prairies as cheap as they could raise it, and they preferred devoting their attention to the growth of cotton. The land is easily cultivated. We rarely ever fail to make an average crop. Water is abundant; running streams are common; springs are frequent, and the finest freestone water can be got by digging from 15 to 30 feet. Fruit of every kind grows in the greatest abundance. Every man who wishes it can have a splendid orchard. The gardens are as fine as could be wished. The vine grows elegantly, and wild grapes are gathered in the greatest abundance; this will one day be a vine country, and the production will be profitable. Tobacco, during the war, was grown to some extent, and those professing to know pronounce it as fine as the products of the best parts of Virginia. The summer range is very fine, and the winter range, though getting shorter, is still sufficient to keep stock through the year. The county seat, Mount Pleasant, is a beautifully located, healthy, well-watered, and pleasant town. A tri-weekly line of stages, from Jefferson to Clarksville, passes here. Dangerfield, Mount Vernon, Crag Rock, and Snow Hill are other towns in the county, all thriving business places, having good schools and churches. There are probably 4000 or 5000 inhabitants there now, and increasing daily by immigration. Land is cheap, and a general disposition is manifested to induce a good class of immigrants to settle there. The mineral resources of the county have not yet been developed, but there are several coal mines apparent, and every reason to believe that Titus will not be behind her sister counties in iron mines when developed. The negroes, since the close of the war, have done reasonably well. The people have treated them kindly, and they seemed to appreciate it. Still, there is a disposition on the part of the citizens to employ white laborers when they can be procured.

THROCKMORTON COUNTY.—(*Unorganized.*)

Lies immediately west of Young. The Clear fork of the Brazos, running from west to east, passes through the southern portion of this county, which is a fine section of country, well watered, and has abundance of mesquite timber. The good land is mostly in small but beautiful valleys along the streams. Back from the water-courses, it is somewhat broken and rocky, but covered with fine grass, mostly curly musquite. Butterfield's Overland Mail route passes through this county. There are some settlements made on the Clear fork of the Brazos.

WISE COUNTY.—*By F. J. Barrett, Representative.*

COUNTY SEAT, DECATUR.—The agricultural products of this county are corn, wheat, rye, barley, oats, Hungarian grass, and sorghum or sugar-cane. The corn crop is better than for several years past. The wheat crop is rather less than formerly, on account of the heavy rains destroying the bloom in the earlier part of the season, and partly by rust later in the season. Plenty of wheat and corn will be made, however, to answer all the demands in that county. Oats were never so good. Barley and rye are good, and, considering the crop as a whole, it is far above an average. The voting population is about 400. There are very few freedmen in this county, but they are generally at work and doing well; we have no Bureau here, and the freedmen are quiet, happy and contented. The climate is delightful. The country is somewhat broken and well supplied with water by running springs, creeks and good wells. The soil is peculiar and varied, from the rich loam of the valleys and fertile high black lands, to the poor prairie and post-oak lands, the former, however, greatly predominating. The west fork of Trinity runs through the county in a southeasterly direction, which abounds with plenty of building timber, and for other purposes. From this stream, a little west of the centre of the county, runs the belt or skirt of timber known as the "upper cross-timbers," in a northerly direction, through Montague county to Red river, distant from the county seat of Wise some 45 or 50 miles. This is a fine grazing country for all kinds of stock; the grass is better now than for several years. Fruit does well, as far as has been tried. There are as yet no post-offices established. Decatur and Prairie Point were two flourishing villages before the war, and are beginning to look up again, the former being the county seat. In the southwestern part of the county salt water is to be found in large quantities, from which the inhabitants manufacture salt for their own use. The inhabitants are generally employed in agriculture and stock raising. There is a plentiful supply of milk, butter, cheese, eggs, poultry, etc.

YOUNG COUNTY.

COUNTY SEAT, BELKNAP, is the most important of the northwestern counties. Fort Belknap, for many years a military post, was always a place of rendezvous for all surveying, exploring or navigating parties. This county is well timbered, well watered, has good lands, plenty of rock and abundance of stonecoal. On the Clear fork of the Brazos, and about its junction with the main Brazos, are some as fine bodies of land as are in the State. The Indian Reserve, where the friendly Indians were formerly located, contains a fine body of land. Young county was settled some five years in advance of the surrounding counties, but during the late war became nearly depopulated. Belknap, the county seat, is situated near the Brazos river.

GEOLOGICAL RESOURCES OF TEXAS.

BY S. B. BUCKLEY.

The Geological Survey of the State having only been in progress during a portion of the three years immediately preceding July, 1861, little has yet been done in the discovery of valuable minerals, with the exception of iron and coal; or toward defining the different geological series of rocks. We will only briefly allude to the actual and prospective mineral resources of Texas, and refer those who wish for further details to our preliminary report of the survey.

The Azoic rocks of Llano county contain immense beds of magnetic iron ore—the magnetite of the mineralogists, which, as is well known to manufacturers of iron, is the best of ores—yielding the greatest per cent. of metallic iron. This is the same ore as that of the celebrated iron mines of Norway and Sweden. It also occurs in the Azoic rocks of the northeastern part of the State of New York, where during the last few years it has been wrought extensively.

The largest deposit of iron ore known in Llano county is on Jackson's creek, a tributary of the Llano river. It is near Mr. Epperson's, about 12 miles west of the town of Llano, and nearly 8 miles east of the Smoothing Iron mountain. It is a massive iron hill, from 25 to 30 feet high above its visible base; about 800 feet long and 500 feet wide, with an estimated elevation of from 200 to 300 feet above the surface of the Llano river at low water mark. This ore has been tested on a large scale, and found to yield more than 70 per cent. of metallic iron; which was pronounced by some blacksmiths to be equal to the best Swedish iron. Our route to it was by way of the Smoothing Iron mountain, over a comparatively level, hard, sandy road; a soil formed by the disintegration of granite. Nearly the whole distance, (about eight miles,) we passed through open post-oak woods, interspersed with hickory and blackjack, (*Quercus nigra.*) We saw sufficient timber surrounding the iron hill, and in its immediate neighborhood, for manufacturing purposes during many years. Iron made by the use of charcoal is superior to that made by any other fuel; so says Overman, who is a good authority in metallurgy. The limestones of the Paleozoic and Cretaceous rocks are in the vicinity, from whence abundant materials for a flux can easily be obtained. The Steatites or soapstones of the county can be used in the construction of furnaces. The cost of obtaining the ore is little, for it lies already at or near the surface. Immense blocks of ore lie scattered over the iron hill or near its base. It is in a dry, healthy climate, where there would be little or no loss to either the workmen or manufacturer, from sickness or bad weather. Plenty of provisions can be had from German and other farmers in the surrounding country. It is in a comparatively level country, with a hard, gravelly soil, over which there are good roads throughout the year. Most of the mountains of Llano county are isolated, and scattered at distant intervals over the plain. Constant flowing streams are in that vicinity. We make these statements to show the great advantages here presented for the manufacture of iron.

A large bed of magnetic iron ore, of a similar character to the preceding, occurs eight miles distant, in a northwesterly direction. It lies between two granite ridges, and is traversed by quartz in all directions. At both of these localities the ore has evidently been ejected up from below at the same period with the granite, and by the same igneous forces; hence these ores are true metallic veins, and their supply is inexhaustible.

On Comanche creek, near Comanche mountain, in Llano county, are extensive dykes of hornblende rock, inclosing large masses of soapstone. One of these beds of steatite or soapstone is about 300 feet wide, and extends in a westerly course toward the Hondo creek, where, at the distance of eight miles, it appears again. It has a light gray color, a fine grain, and a very compact texture, yet so soft that it can easily be cut with a knife or sawed into thin boards. It is an excellent material for the construction of furnaces, fire-places, ink-stands, etc., etc. It can also be used for fence-posts, as is done in some parts of New England. Pounded fine and mixed with a little grease or tallow, it forms a very durable article to lessen friction in the axles of wagons and carriages, for which purpose wagoners from a distance obtain it, considering it neater, better, and more lasting for that use than anything else.

There are some large veins of ore containing a small per cent. of copper on the Little Llano river, about eight miles above its mouth. It resembles the gray oxide of copper, and, on exposure to the air becomes more or less coated with a blueish green color. Its composition is mostly iron, and it is very similar to surface indications at the copper mines of Ducktown in the southeastern part of East-Tennessee. It is there termed by the miners "gossan," or the "blossom" of copper. These Ducktown mines have been a source of great wealth to their owners; and it is possible this Llano mine may prove to be equally profitable. The ore is in veins of a few feet thickness, between gneissoid metamorphic rocks, on the borders of the granite. These veins were partly covered with gravel and soil, formed by the disintegration of the granite hills, near the base of which they are situated. Their gelogical position is such as to lead us to expect that mining will here be a lucrative business.

The metamorphic are those stratified rocks whose form and composition have been altered by heated granite or other rocks of igneous origin; hence they are rarely in horizontal strata, but more or less inclined, broken, and contorted by the immense power exerted upon them at the time of the upheaval of the granite and its associated rocks. The metamorphic rocks are here on the outskirts of the granite in highly inclined strata, having evidently been thus lifted up at the time of the upheaval of the granite from its fiery bed below. These metamorphic rocks are interesting, as commonly being the depositories of the precious metals, especially gold and silver. They occur over quite a large section of country, a few miles south and southeast from Fort Mason, in Mason county, from which they extend westward into geologically unexplored regions. They consist chiefly of micaceous shales, with quartzose veins, in appearance much resembling the gold-bearing rocks of some parts of North Carolina and California. At a place about eight miles south of Fort Mason we obtained a small quantity of gold in the *debris* of these rocks; but, as our stay there was less than an hour, those rocks need another and much more thorough examination.

Bowie, Davis, Marion, and other counties in northeastern Texas abound in iron ores, some of which have been wrought to a considerable extent. They are said to yield about 60 per cent. of metallic iron, (the Nash foundry near Jefferson, Texas, yields 75 per cent. of metallic iron,) and are hematites or peroxides of iron. In Bastrop and Caldwell counties the same species of iron ore is abundant in the sandstones of the Tertiary Period. Enough is already known to assure us that the State has sufficient iron, not only to supply its own wants, but also those of the entire south during many ages. These hematites, although they may yield only from forty to fifty per cent. of metallic iron, can, without doubt, be profitably manufactured, on account of the abundance of fuel in their neighborhood, the facility of transportation, and the little expense of obtaining the ore, which is generally in hills at the surface. Most of the mines of Pennsylvania afford only about 50 per cent. of metallic iron, and that State produces about half of the entire iron made in the United States.

Extensive lignite or brown coal beds are in a large portion of the Tertiary region of the State, as far as has yet been examined, namely in Bastrop and adjoining counties, and many of the counties east of the Trinity river. On Cedar creek, west of the Colorado river, near the town of Bastrop, we measured some of these beds of coal, which are five feet thick, in nearly horizontal layers. Lignites have generally about ten per cent. less carbon than bituminous coal, and have that proportionate value for fuel. The amount of carbon in all mineral coals varies greatly, and can only be determined by chemical analysis. Some of the best brown coals are equal in value to inferior bituminous coal. Sulphuret of iron often occurs in both lignite and bituminous coals to such an extent as to render them unfit for smelting iron ores, (on account of the strong affinity of sulphur for iron,) until they have been made into coke; hence the greater value of charcoal and anthracite in the manufacture of iron.

We made a hasty journey to the region about Fort Belknap, and saw that the coal measures, in their characteristic forms, occupy a large extent of country in Young and its adjacent counties. The rocks are sandstones, limestones, and shales with seams of bituminous coal. They have the well-known fossils peculiar to the coal measures of the western States in the upper valley of the Mississippi. There is a bed of coal about three-quarters of a mile above Fort Belknap, in a small ravine near the Colorado river. From this place coal was obtained both for fuel and for blacksmithing when the fort was occupied by the government troops. After the removal of the soldiers the bank above the coal fell in, so that now there is no good view of the coal-bed. We saw this bed of coal exposed higher up the ravine, with a thickness of about three feet. On Whisky creek, about two miles north of Fort Belknap, there is a fine exposure of the coal, where there is the following section near its mouth, a few rods from the Colorado:

1.	Surface soil, sandy loam	1–2	feet.
2.	Sandstone (conglomerate)	44	"
3.	Coal	1½	"
4.	Sandstone and shale alternating	8	"
5.	Coal	3½	"
6.	Sandstone	26	"
7.	Shale and limestone (fossiliferous)	2	"
8.	Coal	1½	"
9.	Light gray friable shale to bed of stream	3	"

A few hundred yards higher up the stream, where coal has been mined to some extent, and where one man is said to have dug out seventy-five bushels in a day of a good quality of coal, there is the following section:

1.	Slope covered with sandstone	—	
2.	Black, yellow and ash-colored shales	10	feet.
3.	Fine grained sandstone	½	"
4.	Blue fire-clay	1½	"
5.	Coal	4	"
6.	Clay containing selenite	½	"
7.	Slope to the creek	—	

Here the sandstone above the coal contains coal-plants, and is ripple-marked. There are several other places on Whisky creek where the coal crops out. North of Fort Belknap about six miles, near Judge Harmonson's, is a seam of coal five feet thick. This bed is exposed along the base of the hill from twenty to twenty-five rods. Coal has also been obtained here both for fuel and blacksmithing. On the Camp Colorado road, in several places in Buchanan county, we saw seams of coal exposed in the hill-sides. In the Palo Pinto county bituminous coal occurs, and is used by the blacksmiths of that section. The rocks in the bituminous coal region are in nearly horizontal layers, or dip at small angles. There are salt springs in the eastern yart of Llano county, and also in the western part of Lampesas county, where sufficient salt for the wants of the country is made.

In the Geological Rooms at Austin, previous to the late war were specimens of gold, silver, copper and lead, obtained by casual explorers in the western and north-western parts of the State. Those of gold and silver have been taken away, but there still remain in the cabinet rich specimens of copper and lead from those regions. Geological indications and these specimens lead us to confidently predict that those portions of the State have vast mineral wealth. Our extensive lignite and bituminous coal-beds and bituminous springs in various sections of the State, which our limits will not permit us to notice, also promises large yields of petroleum.

MINERAL AND AGRICULTURAL RESOURCES OF TEXAS.

BY A. R. ROESSLER.

During the time from 1858 to 1861, while engaged in the Geological Survey of the State of Texas, under Governors H. Runnels and Sam Houston, the writer visited numerous localities, extending the explorations over a considerable portion of the State. The late war prevented any account of these investigations being made public. The soil and climate of Texas are excellent. Whilst the pregnant mountains and valleys abound in valuable minerals, are well supplied with timber, agricultural and pastoral advantages, water power, &c., they supply additional and very potent inducements to extensive colonization and speedy settlement.

It has been determined that within the limits of Texas occur the most complete series of geological formations to be found in any State of the Union, ranging as they do from the Potsdam sandstone of the Palæozic era to the latest Tertiary, and presenting an aggregate thickness of many thousand feet. The occurence of true bituminous coal in the region of Fort Belknap cannot fail to afford important future welfare to the State. It has been ascertained that the area occupied by the coal strata cannot fall short of five thousand square miles, and have a thickness of not less than three hundred and fifty feet.

Texas embraces within her limits vast accumulations of iron ore. The principal deposits are found in Llano county, seventy-five miles northwest of Austin city, in primitive rock formations, in the azoic rocks, or those which were made before the appearance of animal life upon our globe.

Passing up the country from Llano town in a north-westerly direction, we discovered on Johnson's, otherwise called Erskin's creek, immense loose masses of iron lying scattered over the surface, and came to an iron hill nine hundred feet in length and five hundred feet in width, elevated three hundred and seventy-five feet above the level of Llano river. It is apparently a solid mass of iron, which has been upheaved by igneous agency, and extends to unknown depths below; it is partly magnetic and partly specular iron ore, being similar to that of the celebrated Iron

Mountain of Missouri, and is remarkable for its purity and inexhaustible abundance. The chemical analysis shows that it is nearly a pure oxide of iron. An average specimen, analyzed in the State Laboratory, gave—

Matter insoluble, silicious,	2,818
Mixed oxides of iron,	96,890
Total,	99,708

Metal iron in 100 pounds, 74.93.

Red felspathic granite, gneiss quartz, talcose, and chloritic schists are the prevailing rocks in its vicinity. Granite ridges nearly surround this deposit, and veins of quartz traverse it in all directions. This locality seems intended for the erection of iron furnaces to manufacture iron, as every thing requisite is on the spot—limestone for flux, timber in great abundance, soapstone or steatite for the interior brick work of the furnaces, and water power.

Among the combustible minerals may be first mentioned the existence of petroleum at various localities. In Hardin county, at Sour Lake, in the southeastern corner of the State, and about fifty miles from the Gulf of Mexico, are the same surface indications as were those of the now famous oil wells of Pennsylvania and northern Ohio, prior to the discovery by deep borings of inexhaustible quantities of petroleum or rock oil. A number of acid springs which surround the lake present considerable diversity both in temperature and relative properties of mineral ingredients. All of them yield petroleum and carburetted hydrogen gas in more or less abundance. The petroleum may be seen constantly rising in small globules, which, coalescing, form a scum upon the surfaces of the springs. The sides of the springs are also coated with this substance. The water of the lake is quite sour, owing to the remarkable acid property it contains; it issues from springs, both at its bottom and the adjacent shore. The disagreeable fœtid odour of it is caused by the presence of petroleum, which rises from different parts of the lake in the form of small globules and floats upon the surface of the water. Besides petroleum, bubbles of carburetted hydrogen constantly escape from every part of the surface of the lake. This remarkable locality belongs to the Miocene tertiary period, which forms a broad belt from fifty to seventy-five miles wide, and margins the coast for several hundred miles.

In addition to this, numerous veins of galena or sulphate of lead, oxide, and carbonate of copper, native copper, inexhaustible abundance of marble, fire and potter's clay, gypsum, and lignite are found in many parts of the State. To develope the wonderful resources of Texas an immense amount of labor is needed, and to this I would call capital, enterprise, and education.

The collection of soils, clays, rocks, ores, coals, and fossils made during the survey was very extensive and interesting, and would have thrown considerable light on disputed points in the geology of the West and Southwest, when carefully studied; but unfortunately, during the war, the State geological rooms were converted into a percussion cap factory, and the entire collection either destroyed or carried away, with the exception of a magnificent mass of meteoric iron, from the head waters of Brazos river, weighing 345 pounds, which was probably too heavy to be easily moved. This is one of the finest examples of native iron to be found in any cabinet of the United States. Had I the time and space I might pursue the subject in detail, but will resume it at some future time.

THE SOIL AND PRODUCTIONS OF TEXAS.

GENERAL REMARKS.

It will be seen, from the description given in this work of the various counties of Texas, that there are many of the most necessary products, common to them all, such as corn, potatoes, some small grains and vegetables generally; also horses, cattle, hogs and sheep. Corn, which is, perhaps, the most important product of the soil, is that which is almost universally and easily raised, and, though potatoes and other vegetables may be dispensed with, with less inconvenience than corn, yet they rank as next in order in point of importance among the necessaries of life for subsistence, and require but little labor and attention to be raised in any county of the State. Cattle, hogs, sheep and horses, without which no Texan would feel that he could get along with any comfort, are raised almost without cost in any part of the State. Immigrants from other countries are astonished to find how easy it is, anywhere in Texas, to have as many of these animals as they have any use for, and how little capital and labor are required, with industry, to accumulate large fortunes in every part of our State, in stock-raising. It will, however, be seen that certain portions of our State are better adapted to raising cattle and horses, others to raising hogs, and others again to sheep-raising. The western counties present a vast expanse of the finest grazing for stock in America, where herds of thousands are annually becoming marketable beeves without any expense the year round, but that of herding and branding. In those counties are also found some of the best sheep ranges, where fortunes are being made on the smallest capital, merely enough to purchase the finest breeds of rams, by which means the coarse Mexican wool of twenty years ago has now been generally so improved in quality as to command three or four times the price. No forage or feed of any kind is required to be gathered for winter use; cattle, sheep and horses feed themselves winter as well as summer. In the more northern counties, however, where the stocks are smaller and the winters colder, many farmers find it better to have some hay or fodder to feed to their milch cows and sheep in the worst weather. In those counties the stock ranges are frequently timbered lands, which afford protection from the cold.

The cotton region of Texas embraces nearly all the counties east of the San Antonio river, and eastward of a line due north from the town of San Antonio to Red river. But the counties best adapted to cotton are those on the Guadalupe, the Colorado, the Brazos, Old Caney, Oyster creek, the Trinity, Sabine and Red river, where, in ordinary seasons, the yield has usually been almost a bale (500 pounds) to the acre. There has never yet been cultivated one hundredth part of the rich cotton lands of these counties. The vast wealth of the cotton region of Texas is still undeveloped, and millions of acres of the finest cotton lands in the world are still lying useless as they were fifty years ago. But although the river lands above designated yield the largest crops of cotton, yet the uplands in all the counties designated usually yield from one-half to three-fourths of a bale to the acre, and their cultivation is often found to be quite as profitable as the bottom-lands, from the greater facility of cultivation. Taken together, the cotton counties constitute near one-third of the area of Texas, and have a larger amount of rich virgin soil adapted to this staple, than probably all the cotton States east of the Mississippi.

The wheat region of Texas, though it embraces some thirty counties, and perhaps many more not yet settled, is not as extensive as that adapted to cotton. By this we mean those counties especially adapted to wheat, the average yield of which, in ordinary seasons, is about 21 bushels to the acre. We say this because, in fact, wheat may be and often is grown to a limited extent in most *of the cotton* counties down to the coast, the yield being 10 or 12 bushels to the acre. Rye and barley are more generally grown, and yield better in the lower and more western counties than wheat. Indeed, barley has proved to be one of the most reliable and profitable products in most of the cotton as well as wheat counties. Oats are also quite generally raised in all the more settled portions of Texas. The wheat region, properly so-called, embraces chiefly the northern portions of Texas, Dallas being near the centre of it.

That portion of Texas adapted to the common sugar cane is far more limited, and is confined chiefly to a few counties on the lower Brazos and Colorado, and intermediate region, and to the lower Trinity. But as cotton has generally been found to be more profitable, sugar has been cultivated to but a limited extent, one reason for which is probably the heavy outlay required for sugar-houses and machinery. Heretofore Brazoria county has produced probably fully three-fourths of all the sugar raised in the State; the total amount never having exceeded 7000 or 8000 hogsheads, with the usual proportion of syrup or molasses. We should here remark, however, that the sorghum or Chinese cane is well adapted to nearly all portions of the State, and there are few settled counties where it is not raised for domestic use. It is found to be a very useful and profitable crop.

It will be seen from our descriptions of the counties of the State that poultry is raised in abundance in them all. If there is a family in Texas without chickens, eggs and butter it is their own fault; that is, if they have been here long enough to raise a crop. Tobacco has been raised to but a limited extent, though before the war several counties raised it for export, and it is now well known that it may be profitably raised in most parts of the State, and the quality is said to be quite equal to that of Virginia. But few of our people, however, have understood its cultivation, and fewer still know anything of its manufacture. Most of that which is raised is either used in the leaf or manufactured into cigars for domestic use. There is, however, no doubt that it will become an important article of exportation in a few years.

Rice is grown in but few counties and only for family use, and very few of our people know how to raise it. The upland rice may, however, be grown successfully on the low, marshy and hummock lands throughout the State.

Before the war Sea Island cotton was successfully cultivated by a few persons on the islands along our coast, and also on the main lands bordering on our bays. But the want of the proper kind of gins for separating the seeds from it, renders its cultivation rather unprofitable, or less so, we believe, than that of the short staple cotton. It is, however, admitted by good judges that, with a reasonable amount of capital and skill, the Sea Island cotton may be profitably grown along nearly our whole coast country.

There are many articles produced in Texas which are not enumerated in our description of counties. Hops, flax and hemp have been grown, but only to a limited extent, but sufficiently to prove that it is only because they have not been cultivated. Buckwheat is also easily grown, and produces well. Grapes grow everywhere with proper attention, and on our sandy soils will eventually become a great staple of the State. It only requires immigrants from the wine-making countries of Europe, who understand the business, to make the cultivation of the vine one of our most profitable branches of agriculture.

We may here remark that the castor-oil bean or Palma Christi, grows with greater luxuriance and more spontaneously than we have ever known it in any other country; and if there is a market for the oil we predict that it will constitute hereafter a profitable product for export and yield a large revenue to the State. But we have no space to enumerate all the products of the soil to which our State is adapted; we can, however, truly say that we scarcely know of any product which is not, or may not, be grown in Texas, as the variety of our soil and climate is such as to adapt our State to both northern and southern products.

THE WHEAT REGION OF TEXAS.

Since the year 1848, the cultivation of wheat in that portion of Texas known as "the wheat region" of Texas, has steadily and rapidly increased, until, at the present time, it has attained an importance little dreamed of in the early settlement of the State. Yet its culture is still in its infancy and imperfect, and the capacity of the State for its production is just beginning to be appreciated.

When it is considered that, in 1850, the whole product of the State was less than 50,000 bushels, and that the estimated product of the past year in that portion north of 32d parallel and west of Van Zandt, Wood, Titus, and Bowie counties, has been something over 6,000,000 of bushels, the great importance of its cultivation as an export will at once be seen.

North-western Texas is emphatically a wheat region, superior to the great majority of wheat-producing countries. The climate, the soil, and the elevation of the country, are peculiarly adapted to the perfect development of wheat. The seasons are suited to its successful seeding and harvesting. That portion of the State which seems to possess most of the requisites for the perfect growth and maturity of this grain, and which may be correctly termed "the wheat region," is contained within the following limits: beginning at the north-east corner of Red River county, thence south-west to Navarro county, thence in a westerly direction to the limits of the new counties, thence north to Red river, and down said river to the beginning. Some of the land comprised within the territory described is not at all suited to the growth of wheat; such, for instance, as the strips from 5 to 15 miles wide, known as the "Upper" and "Lower Cross Timbers," which consists generally of a sandy post-oak soil; but the great body of the land in the above described territory—the black prairies of the eastern portion, and the red lands of the western—can not be excelled by any country of equal extent in its capacity for producing wheat. Heretofore the black prairies east of the Lower Cross Timbers have been considered as being capable of producing wheat in the largest quantity and of the best quality; but it is now known that the red lands of the Upper Brazos and the southern branches of Red river, will produce the finest grain and the largest yield. The reason for this is, no doubt, to be found in the fact that the soil of the red land is filled with gypsum in a soluble state, furnished by the washings from the great gypsum belt, through which the head waters of the last-mentioned streams flow. I have known a crop of wheat raised on the Clear fork of the Brazos river, which produced as high as 42 bushels to the acre. The black, adhesive soil of the eastern section contains no gypsum; but it is rich in the carbonate and phosphate of lime, derived from the "white rock" upon which it rests. Another variety is the black, sandy soil, found on the river and creek valleys of the Cross Timbers. This does not yield so well as the other varieties, and is less able to stand the droughts. The black, sticky, and the red soils possess a remarkable ability to resist the severe droughts which we sometimes experience. When cultivated, these lands will absorb moisture from the adjacent air with the greatest avidity, and cause any crop grown upon them to look fresh and green; whilst the grass upon the prairie outside, which has not been plowed, will be dried up.

THE KINDS OF WHEAT CULTIVATED.

Since the commencement of the culture of wheat as a principal staple of northern Texas, some attention has been given by enterprising farmers to obtaining the varieties best suited to the country. The variety first sown and cultivated was the Mediterranean. This was a late wheat, and it was so often destroyed by rust that its cultivation has ceased to a great extent. A white wheat from Kentucky has been tried, but has not given satisfaction. The kinds now cultivated are the Early May, the California, and the Red May wheat. The first named, I believe, is the favorite, on account of its ripening early, and thereby being less liable to injury by the rust, and the yield being greater than other varieties. The California wheat ripens later, and is more liable to be destroyed by rust. It is not as productive now as when first introduced. Many farmers sow two or three varieties every year, so that by their ripening at different periods, they are able to save the crop with less force.

But little attention is given to the changing of seed. Some consider that it does no good, and continue to sow the same seed upon the same land year after year. A gentleman of my acquaintance, in Dallas county, has sown the seed he first obtained, on the same land, for the last ten years, and he always has good crops, and his grain is free from smut. Notwithstanding, I am satisfied that if a systematic change of seed wheat was adopted, a large increase in the crop would result.

CULTIVATION—TIME AND MANNER OF SOWING.

More attention is now given to seeding than formerly, and our farmers are learning more about the proper time of sowing. But the great desire which exists of *putting in* a large area, has prevented that careful cultivation which the wheat crop should receive. Very little of the land is plowed before sowing. When the intention is to sow after a crop of corn, no preparation is made except to drag a small stick of timber, 12 or 15 feet long, sideways over the ground, to knock down the stalks and draw them to a ridge or pile, where they are then burnt. The seed is then sown broadcast and plowed in, sometimes with single turning plows, but generally with the *gang-plow.* A few harrow the ground afterward, to level it; but the majority leave the land as it was plowed. The amount of seed put upon an acre varies from one to one and a half bushels—the latter being the amount most commonly sown. Nothing more is done until the harvest.

The cultivation of wheat requires the work of one hand for about five weeks in the year, for twenty-five acres—about fourteen days for sowing and plowing in, and sixteen for harvesting. If the gang-plow is used, one-half the time occupied in planting is saved, as one man can easily do the work required for twenty-five acres in seven days, or less.

WHEAT AS A WINTER PASTURE.

If the soil is in good condition, as regards moisture, when planted, the wheat grows off rapidly, and by the last of Novembec furnishes the finest of pasture. Even when a freeze comes in the winter, and kills the green blade above the ground, a few days of warm south wind reproduce it, and the pasture is as good as ever. As to the value of pasturing in retarding the the growth of wheat until after the danger from spring frosts has passed, conflicting opinions are entertained. Although nearly all pasture their wheat, a majority now believe that it lessens the product materially, and does not prevent injury by late frosts. Still, the advantage derived from pasturing more than counterbalances the loss in product, as the farmer can keep his cattle fat upon the wheat, which enables him to make an abundance of butter. The butter obtained from cows pastured upon wheat is superior in quality, of a rich golden color, and keeps much longer than that made from the ordinary prairie grass.

THE HARVEST.

The period of harvesting is from the 10th to the 31st of May, the early May wheat being the first reaped. The time of cutting does not vary more than four or five days. Reaping machines are now exclusively used, among which are the Kentucky and Buckeye Harvesters, and Maury's and McCormick's Reapers. The two first are the favorites. With four horses and ten men, from twenty to twenty-five acres a day can be cut—one to drive and manage the machine, one to rake, and eight men to bind and shock. None of the newly-improved self-rakers have been used, although a few were last year introduced into the country; they arrived, however, too late for the harvest.

After reaping, the wheat is left in the shock for a few days, and then either threshed out or stacked. Last summer, a large amount of wheat was destroyed by rain, because of the scarcity of threshers in the country. And even after the new machines arrived, and were put to work, the crop was not all threshed out until after September. There never has been until last year a sufficient number of either reapers or threshers in the country; but hereafter it is hoped that there will be no lack of them, as there have been agencies established in several towns for their sale, and it seems to be the determination of the agents to afford every facility for enabling every farmer to supply himself on reasonable terms.

After threshing, the wheat is exposed to the sun for a day or two, and then put away in granaries, where, if kept from the light, it will keep sound for years, undisturbed by the weevil.

THE YIELD, QUALITY, ETC.

The yield of the wheat crop for 1866 has not turned out as well as was expected. In the spring it was confidently stated by those who were judges that a full crop would be made, which would have been an average of twenty-five bushels to the acre. The causes of the deficiency were first, a heavy rain at the time when the wheat was in bloom, washing the pollen from the flower, and thus rendering the grain abortive. Many fields did not produce enough to re-seed them. This accident happened only to the earliest wheat. Had all the fields been in bloom at the time the crop of course would have been a perfect failure.

Some of the late wheat, too, was destroyed by the rust. From all the information I can get, the loss from these two causes was about one-fourth, (¼,) making the crop come down to eighteen bushels. But another cause still further reduced it—the continued rains in June, when most of the wheat was in the shock waiting to be threshed. So that fifteen bushels is considered to be a fair average of the crop for 1866.

When properly sown in ground sufficiently moist, and properly prepared, and if it escapes the killing frosts of April, heavy rains when in bloom, and the rust, a crop of thirty bushels of wheat to the acre may be relied on. Parts of some fields in Dallas county, within my own observation, last year produced as high as thirty-five bushels to the acre.

The quality of the wheat is generally good, the grain being large and plump, except when injured by rust. It is always heavy, rarely weighing less than sixty, and frequently going as high as seventy pounds to the bushel. But it is the quality of the flour made from it that renders Texas wheat far superior to that grown elsewhere. It is whiter than any northern flour I have ever seen, and for sweetness and fine flavor far surpasses it.

New flour can be manufactured ready for market early in June, from six weeks to two months earlier than it can be sent to the southern markets from the north. This is an advantage which will always give to Texas the control of the market, at least for that period.

COST OF PRODUCTION.

The home market for wheat, last year, opened at $1 per bushel, and by October the price had reached $1 25. Before the next crop is saved it will be worth at least $1 50. These prices are kept up, notwithstanding the difficulty of getting the crop to market. We have no other means of transportation than ox-wagons. If no serious disaster occurs, the price this year will be much less, as a largely increased area has been sown, and our means of transportation are insufficient, confining our market to our own doors.

The following estimate of the cost of producing, and the profits derived from wheat-growing in this country, is a very fair one, calculated for twenty acres:

Seed wheat, 25 bushels, at $1 25 per bushel	$31 25
Sowing and plowing in, with gang-plow, 5 days	15 00
Reaping, binding, and shocking	27 00
Threshing	30 00
Rent of land, $1½ per acre	30 00
	$133 25
Twenty acres producing an average of 18 bushels to the acre, at $1 per bushel	$360 00
Profit	$226 75

This calculation makes the cost of producing a bushel of wheat 37 cents; but if the crop is put at fifteen bushels to the acre, (the estimate for 1866,) the cost would be 44⅓ cents per bushel. It has always been estimated that 50 cents per bushel would barely pay the cost of production, and that when sold at that figure the farmer gets about $1 per day for the time he is employed in making his crop.

TRANSPORTATION.

Ox-wagons furnish us our only means of taking our produce to market, and costs about $1 per 100 pounds for each 100 miles. The grain itself is never sent off, but is ground at the mills of the country, and the flour, put up in sacks of 100 pounds, is taken, generally to the terminus of the Central Railroad, sometimes to Marshall and Jefferson. Large quantities are sent into the Indian Territorry to supply the agencies, etc. Lately a great deal of interest has been excited by the movements of the two Pacific railroads, (the Memphis and El Paso and the Vicksburg and El Paso,) and there has grown up a strong desire to aid them, by the people of the northwest. These companies, it is stated, have made arrangements to complete their roads for a distance of 200 miles within two years from the present. The Memphis and El Paso road runs through the northern tier of counties, the surveyed line striking the Brazos river some twenty miles south of Belknap; the line of the Vicksburg and El Paso runs through the State a little north of the parallel of 32°, and, if no union is arranged, will *cross* the former road, crossing the Brazos at Belknap, or running up to its valley. Nearly all the cattle driven out of northern Texas, go east, none south; and it is contended that either of these roads, when built, will be of more use and advantage to us than any road communicating with the coast. Our flour can be taken direct to the Mississippi, and at less than half the cost which would be charged to transport it to New Orleans by the Houston and Texas Central. But our people intend to take advantage of the first road that offers. The railroad is what they want. One snort of the "iron horse" reverberating over our prairies, will wake to life the dormant energies of our rich and productive soil, and give such an impetus to the growth of our staple, that its transportation will afford remunerative employment to more roads than those which are now pointing in this direction, besides enriching by its products their *termini.* Calculations as to the amount of this trade can be made by almost any one. When the territory which has been described as "the wheat region," shall have become settled by an energetic population, such as will seek homes on its fair and fertile plains, and railroad facilities afforded, wheat can be produced in sufficient quantities to feed a continent.

"THE WHEAT REGION" AS A HOME FOR IMMIGRANTS.

No portion of the Southern or Western States possesses so many attractions for the immigrant as north-western Texas. Blessed with a climate of Italian beauty, and of remarkable healthfulness, possessed of a varied and fertile soil, and supplied with an abundance of wholesome food at low prices, the seekers after new homes for themselves and their posterity will find in it a "promised land" equalling their most sanguine expectations.

The only disagreeable feature of our climate is the "northers," which, in a greater degree, are common to all the prairie States west of the Mississippi river. These winds are prevalent only during about three months of winter, and occur on an average about once in two or three weeks, during the months of January, February and March, lasting from one to three days. The temperature, during these "northers," is not often lower than 32°, the lowest having occurred in January, 1856, when the thermometer indicated a temperature of 9° at sunrise on the 28th, and 42° at midday. In the intervals between the "northers," the thermometer ranges from 56° to 70°, and at these times every description of farm labor can be carried on. The temperature of spring and autumn is moderate, and that of summer is not excessive, the heat at midday rarely going beyond 90°. Nowhere else is the temperature so equable as here, and the changes from one season to another are so gradual that they are scarcely observable.

Land is cheap, and can be obtained in quantities to suit almost any means. The farms are usually made upon tracts of from 640 to 1280 acres, from 50 to 100 acres of which are under cultivation, the rest lying idle, or serving as public pasture; and there is scarcely any owner who is not willing to sell off a portion of his land. The prices *asked* for unimproved land vary greatly, but good land within 3 or 4 miles of almost any town can be had at from $2 to $4 per acre, sometimes even less. Improved farms, of course, command higher figures, but the best of them can at this time be bought at from $8 to $15 per acre.

Those immigrants who are unable to purchase land, can obtain employment at good wages. Farm-laborers, particularly, are greatly in demand. There never has been a time since the settlement of the country that a white laborer or mechanic, of industrious habits, has been unable to obtain work at remunerating prices. The farmers here are now compelled to employ the freedmen, of whom, however, there are but few in north-western Texas; but there is no dependence to be placed upon them, either to comply with their contracts, or to work faithfully during the time they remain with their employers; and if white labor could be obtained, the freedmen, as a body, would soon migrate to a country more congenial to their habits and tastes.

As in all new countries, where agriculture is the chief pursuit, it costs but little to obtain good and wholesome food in north-western Texas. Flour at $3 per cwt.; beef, the fattest and of finest flavor, at 2½ cts. per pound; pork at 5 cts. per pound; fat mutton at 75 cts. per quarter; and milk and butter for the trouble of taking care of the cows, constitute the basis of a bill of fare which any one can obtain here at all times. Then we have honey, equaling in flavor that from Mount Hymettus, peaches and other fruits in their season, and that delicious nut, the pecan, which costs nothing but the trouble of gathering; and there are none so poor but they can obtain an abundance of all that has been mentioned.

The future of the "wheat region" can hardly be estimated. When railroads shall have penetrated it, its production will be increased a thousandfold. Now is the time, therefore, for the enterprising immigrant to establish himself, before the railroads shall have increased the value of lands. The golden lands of the Rocky Mountains contain no such mines of wealth as the broad prairies of Texas; and when the placers, gulches, and quartz-veins of Idaho, Montana, and Colorado shall have ceased to yield their yellow dust, north-western Texas will be on the high road to wealth and power, the fruition of which can scarcely be realized.

E. W. RICHARDSON,
Editor Galveston News.

[From the Texas Almanack.]

MANUFACTURING IN TEXAS.

The late Legislature has passed more acts of incorporation for manufacturing companies than have ever been passed by any previous Legislature. Those for cotton and wool factories number some twenty or thirty, and if one half of these go into operation, they will confer immense benefits upon the State. The two that are now nearly completed near Houston will make some eight or ten in operation, which, together, will turn out some 10,000 yards of cloth daily, besides a large amount of yarns for the supply of the hand-looms in all parts of the State, but which will soon be superseded by the much cheaper fabric from our factories. The Bastrop Manufacturing Company, of which P. R. Smith is President, is the oldest in the State, and has 1100 spindles, with looms sufficient to turn out 800 or 1000 yards daily, in addition to yarns. The Waco Manufacturing Company, Geo. E. Burney, President, has some 1000 spindles and 20 looms, and turns out about 700 or 800 yards daily, both woolen and cotten goods. The Comal Manufacturing Company, at New-Braunfels, H. Runge, President, has 800 spindles and 21 looms, and turns out 700 or 800 yards daily. The two factories near Houston are of greater capacity, and, as we learn, will turn out abeut 2000 yards each daily. Machinery has lately gone forward to Palestine for a new factory at that place, with 50 looms. We learn that the machinery has been brought from Europe by Mr. J. Murchison.

In order to give our readers some idea of the profits of manufacturing in Texas, and in the South generally, we need only call attention to the fact that, according to the late Northern accounts, the profits of manufacturing there amount to from 50 to 75 per cent. annually. To determine what will be the profits in Texas, we must bear in mind that the manufacturers of the North have to pay, on an average, 25 per cent more for the raw material than it costs our own manufacturers. Then again, in sending the fabric South for sale, the Northern jobber makes about 25 per cent profit on the cost, including the cost of the raw material. These two large items are saved by the Texas manufacturer, who sells directly to our own merchants, and this saving amounts to $56.25 on every $100. If, then, the Northern manufacturers make a profit of 50 or 75 per cent., what will be the profits of our own manufacturers, if they sell at the same prices in our markets? Our advantages in the manufacture of wool are still greater, as the wool is sold here for about one half the Northern price. So, at least, an experienced manufacturer informs us. The truth is, there never were before so many strong inducements for the South to embark largely, and as rapidly as possible, in manufacturing; and the late complete revolution, nearly destroying our agricultural labor, compels thousands of our citizens to embark what little means they have left in some other pursuits, and none certainly offers such profitable returns as manufacturing. But with all the enterprise and energy we can bring to bear in this direction, it will probably be twenty years before the South can manufacture enough to supply our own consumption.

HOUSTON CITY MILLS MANUFACTURING COMPANY.

We are indebted to General John S. Besser for the following: The following are the officers of the above Company, to wit: B. A. Shepherd, President; R. S. Willis, Vice-President, and J. S. Besser, Superintendent. The capital stock is $100,000, divided into $100 shares. Gross cost of machinery, engine, and buildings, when ready to commence manufacturing, $86,000 coin. There will be 50 looms, 2288 spindles—including one jack of 240 spindles for wool—and one set of woolen cards. The whole is capable of making 2000 yards per day, 500 of which will be woolens, similar to the *Kentucky* jeans of *olden* times when *shoddy* cloth was not known. The balance—1500 yards—will be of the first quality of brown sheetings and shirtings. The mills will also be capable of making a *surplus* of *warp* yarn for sale. The cotton machinery was made by the "Dean Cotton Machine Company," at Taunton, Mass. The woolen machinery, shafting, etc., by Davis & Furber, of North Andover, Mass. Both firms are favorably known as the makers of the machinery now in use in the Texas Penitentiary, the quality of whose fabrics stand without a *rival* North or South. The engine will be of 60 horse power, and is being built by Messrs. McGowan, of the city of Houston. From the unfavorable condition of the weather during the past summer, the Company have been unable to have their buildings completed for the reception of the machinery (which is now all afloat and part received) before next spring. The Company has selected for the site for these mills a tract of 25 acres of land on the bayou below, but within the corporate limits of the city of Houston, and design erecting tenements on the same for the residence of their operatives, or those who may be willing to board them, with a spot for a garden attached to each.

EUREKA MANUFACTURING COMPANY.

This company was organized by S. S. Munger in May, 1866, on a capital of $35,000 gold, which has been since increased to $65,000. It was chartered in October, and reorganized at once, under the charter, by the election of Messrs. Sessums, Longcope, Harrington, Shepherd, and Munger, as Directors; Mr. Munger being the President and Superintendent.

The mills of the company are situated at Eureka, 4 miles from the city of Houston, on the Central Railroad. The buildings are mostly of wood, and substantial. The main building is 225 feet in length, by 45 feet in width, and 16 feet height of story. The machinery, now partly in operation, consists of a powerful steam-engine, a saw-mill, and a cotton and woolen mill running 2000 spindles and 64 looms. The goods made are principally sheetings, shirtings, drillings, denims, cottonades, stripes, ticking, apron checks, ginghams, linseys, kerseys, Kentucky jeans, and all of the staple cotton and woolen goods required in this market. It can produce 2000 yards per day.

Mr. Munger, the proprietor of the enterprise, was the founder of the Bastrop Factory. He is a man of great energy and considerable experience in this business, and the Eureka Mills, under his management, may be regarded as one of the most promising enterprises of the State.

There is a cotton and wool factory at Bastrop, to which, we understand, large additions of machinery have lately been made, and greatly increasing its capacity for both weaving and spinning. We have not, however, received any account of its present condition. The same may be said of the factory at Waco, which has also been considerably improved and enlarged of late. We are not able to give the officers or directors of either of these establishments, both of which have been in successful operation for some two years past. We regret that we have not been furnished with some account of several other cotton and wool factories, and wool-carding establishments in various parts of the State.

EXTRACTS

FROM DR. SHUMARD'S REPORT, GEOLOGICAL SURVEY, STATE OF TEXAS.

In regard to the quantity of coal, we do not speak in extravagant terms when we assert that in the region under consideration there is an abundance of this most valuable mineral fuel, to supply the present and future demands of the State for centuries. With reference to the quality of the Texas coal, it may be stated that it will compare favorably with most of the coals which are wrought in Missouri, Illinois and Iowa. In general appearance and weight it resembles very closely the coal of St. Louis, Missouri, and Belleville, Illinois. It may, however, be stated as a reasonable estimate, that the area occupied by the coal strata cannot fall short of four or five thousand square miles. Taking Fort Belknap* as a starting point, we have found this formation to extend uninterruptedly south-eastwardly to Patrick's creek in the south-west part of Parker county, a distance of more than sixty miles; westwardly about forty miles, and southwardly beyond Camp Colorado in Coleman county. Say one hundred miles. We have not traced it in its northward extension more than six or eight miles from Fort Belknap, but it is highly probable that it reaches into Archer, Baylor and Clay counties. It is also probable that the same formation is developed in San Saba and some of the counties adjacent.

The following analysis, made by Dr. Riddell, in the State Laboratory, shows the chemical constitution of an average specimen from a bed three and a half feet thick, exposed on Whiskey creek, two miles north of Fort Belknap.

Total matter volatile at red heat	44.136
Weight of coke	55.864
	100.
Amount of moisture expelled at 212°	7.8689
Additional matter volatile at red heat	36.2671
Fixed carbon, (coke)	52.3060
Ash, (ochreous brown)	100.

According to Dr. Riddell, this coal cokes without changing its form, and burns with a bright yellow flame.

For the sake of comparison we subjoin the following analysis by Prof. I. D. Whitney, chemist, of the Geological Survey of Iowa, regarded as one of the best coals in that State.

Moisture	3.30
Volatile and combustible	37.98
Fixed carbon	54.35
Ash	2.37
	100.

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* The existance of the true coal measures in Texas was first indicated by Dr. Geo. G. Shumard, in 1851, who mentions their occurence in the region of Fort Belknap. See Marcy's Report of Exploration of Red River,

Besides the coal area just described, it is highly probable that productive coal beds will be discovered in the extreme western part of the State. This opinion is founded upon an interesting group of fossils from the Hueco Mountains, and a part of the Guadalupe Range, which were obtained by Dr. Geo. G. Shumard, while connected with the expedition of Capt. Pope. In this collection I have found with some forms that are undescribed quite a number of well marked species of the Coal Measure. I am also informed by Hon. J. F. Crosby, of El Paso, that coal has been discovered at one or more points in El Paso county. Should future researches develope the existence of workable seams of coal in this portion of our State, they will prove a fertile source of wealth, and their value can scarcely be over estimated.

Connected with the Tertiary Formation, which occupies a vast area in the eastern and middle portions of the State, are extensive beds of brown coal or lignite, which will, I think, be of great service to the public. Our detailed examinations in Rusk show that a large portion of this county is underlaid by deposits of this material, exposures of which occur at a great many localities. The beds examined vary from six inches to eight feet in thickness, and are associated with bituminous, shale, fire and potter's clay, soft quartzose and aigellaceous sandstone, impure limestone and iron ore. At a number of localities visited the lignite appears to be of good quality and adapted for the ordinary purposes of fuel. It varies greatly in character in different sections of the county, some specimens exhibiting the woody fibre with tolerable distinctness, while others show no traces of organic structure, being dull, shining black and very compact in texture.*

In the northeast corner of Cass county, at Stone Coal Bluff, examined by Dr. G. G. Shumard, there is a bed of lignite ten feet thick which resembles the bituminous coal of Fort Belknap, both in external character and chemical composition,† and it is quite probable that it may be employed to advantage in the manufacture of iron. Regular seams of lignite

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* An example of this variety from the neighborhood of Iron Mountain P. O., analyzed by Dr. Riddell, gave the following result:

Specific gravity, 1.094

Moisture expelled at 212°	15.701
Matter volatile at red heat	4.105
Fixed carbon	79.137
Ash	1.057
	100.000

This lignite burns with a somewhat offensive odor, and is remarkable for the large amount of fixed carbon it contains. Its composition seems to indicate that it may be employed in smelting iron ores, both as a flux and as fuel.

† Dr. Riddell's examination of an average specimen of this lignite gave:

Specific gravity, 1,483

Moisture expelled at 212	15.8080	Total amount of volatile matter	55.23
Matter volatile at red heat	39.4220		
Fixed carbon	39.7880	Weight of the coke	44.77
Ash, (grayish brown)	.4992		
	100.		100.

of more or less value have been discovered by different members of the corps, in the counties of Grayson, Harrison, Caldwell, Guadalupe, Bastrom and Fayette, and we have heard of many other localities in various sections of the State which we have not yet been able to visit.

Brown coal or lignite is in general inferior to true bituminous coal which belongs to an older geological formation, nevertheless its importance has usually been underrated.

In Germany and Prussia, large quantities of lignite are annually mined to supply the inhabitants with fuel, and the Tertiary brown coal of the Pacific coast has been successfully employed for purposes of ocean steam navigation. It is estimated that the heat given out by lignite is about one-third more than that of wood. The better varieties of Texas lignite may not only be used as fuel, but it is also probable that some of them may be employed for the manufacture of illuminating gas.

Among the combustible materials may also be mentioned the occurrence of *petroleum*, which has been observed at several points in the State. The most important locality visited is at Sour Lake, in Hardin county, where this substance may be collected in considerable quantities from the surfaces of the remarkable acid springs adjacent to the lake. The earth, for some distance around these springs, is also so highly charged with bitumen as to be employed for purposes of illumination, and, to some extent, as a fuel.

In addition to her coal deposits, Texas embraces within her limits vast accumulations of iron ore, which require only judicious expenditures of labor and capital to be converted into fertile sources of wealth.

Until the commencement of the present survey it was not known that we had workable deposits of iron except in one or two localities. But our labors have demonstrated the important fact that we have a vast iron region in the eastern part of the State, embracing considerable areas in Cass, Harrison, Rusk, Panola, Smith, San Augustine, and Shelby counties. The ore deposits belong to the Tertiary Era, and consist chiefly of hematites and limonites, of which there are several varieties.

According to Dr. G. G. Shumard, Cass county alone is capable of supplying a number of furnaces with an abundance of excellent iron ore for many years. The ore occurs here in regular layers, which sometimes attains a thickness of fifty feet. The only iron furnace our State can boast of is located in this county. It was erected several years since by Mr. Nash, and has been in nearly constant, and I believe profitable operation up to the present time.

The ore is mined near the furnace, and the kinds preferred are a porous variety of hematite, termed by the proprietors "honey-comb ore" and compact brown hematite. The pig metal and castings produced from these ores, are of excellent quality and command a high price in the market. Dr.

Riddell's analysis is of an average specimen of the honey-comb variety from the Nash mines yielded the following result : [*]

Our detailed examinations in Rusk county have developed the occurrence of almost inexhaustible deposits of workable hematite. Similar to that found in Cass, [†] while our general surveys in Cherokee, Nacogdoches and the other counties above enumerated, have convinced us that further explorations will reveal there also the existence of equally extensive accumulations of this important element of State wealth.

Other deposits of iron occur in the Tertiary strata in the middle division of the State, but so far as our observations have been carried, these ores are inferior to those found in the East. In the counties of Caldwell and Guadalupe, examined by Dr. Riddell, are heavy deposits of iron ore, but they contain such a large proportion of silex in the form of sand, as to render them generally unfit for profitable smelting. We have fair workable ores from Bastrop and Washington counties, but further researches are necessary before we can give a positive opinion respecting their value.

Throughout the region of the Coal Measures in the northern part of the State, we frequently find lands of argillaceous iron ore interstratified with the gypseous shales, while the surface of the ground is often thickly strewn with masses of hydrated iron ore from the size of a filbert to that of the double-fist. In Young and Buchanan counties these ores are often quite abundant in places, and they appear to be well adapted for smelting, although our investigations have not been sufficiently minute to enable us to determine whether they occur in sufficient quantity to be wrought with profit.

LEAD.

In the districts examined no important deposits of Lead have yet been found, but we have received from different parts of the State specimens of galena or sulphuret of lead, which induce the belief that future researches will develop the existence of valuable veins of this metal. Thus we have samples of remarkably rich ore from the western part of the State, near El

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[*] Specific gravity, 2.2891

Moisture and matter volatile at red heat	12.227
Silica	8.122
Peroxide of iron	79.064
Loss	.047
	100.

[†] Dr. Riddell's analysis of a specimen taken from an extensive ore deposit in Rusk county, about four miles east of Sulphur Springs, gave :

Specific gravity, 3.3245.

Alumina	1.0360
Siliceous matter, insoluble in acids	8.7941
Peroxide of iron	71.7836
Water	18.3873
	100.

The specimen analyzed represents a variety very common throughout the iron region of this part of the State.

Paso, the Wichita Mountains, in Grayson and Cook counties, and Fort San Saba. In Llano county occurs an interesting ore, the molybdate of lead, which is quite rare in mineralogical collections. Specimens of it from this region were presented to the State Cabinet by Dr. Moore of Burnet, who informs me that it is quite abundant.

* * * * *

COPPER

Exists in many localities in the western and northwestern portion of the State. It is found in large quantities in Devlings Creek and Clay and Wichita counties, and extends on this line across the State. It is native copper, and yields on analysis about 55 per cent. of metal.

NOTES

ON THE

CRETACEOUS AND CARBONIFEROUS

ROCKS OF TEXAS.

BY JULES MARCOU.

[FROM THE PROCEEDINGS OF THE BOSTON SOCIETY OF NATURAL HISTORY,
VOL. VIII, JANUARY, 1861.]

BOSTON:
PRESS OF GEO. C. RAND & AVERY.
1861.

NOTES

ON THE

CRETACEOUS AND CARBONIFEROUS

ROCKS OF TEXAS.

By JULES MARCOU.

A short time after my last return to Boston, June, 1860, I received two memoirs by Dr. B. F. Shumard, *On the Geology of Texas*, in which that eminent paleontologist has expressed opinions differing from those published by me several times from the year 1854 to 1859. From the nature of Dr. Shumard's memoirs, which contain only short notices, without descriptions or figures of the contested species of fossils, without geological maps, and without real sections of the rocks identified, I did not intend to give my views on the subject, especially after having repeatedly explained the stratigraphical relations of the rocks west of the Mississippi.

In the mean time I wrote a letter, in September, to Dr. Shumard, telling him that although his memoir *On the Cretaceous Strata of Texas* was very interesting, I could not agree with him as to the succession given by him in his theoretical section, but that I hoped one day we might meet, perhaps at Fort Washita, or even at Pyramid Mount, and then settle amicably together our different views. Dr. Shumard did not answer my letter, and I supposed, from his silence, that he was content to leave the matter as it was, until further researches were made; but Mr. Meek having called the attention of the readers of *Silliman's Journal*, vol. XXXI. Jan. 1861, p. 127, to the views of Dr. Shumard in opposition to mine, and taken special care to indorse his own previous opinions and those of his friends and collaborators, Messrs. James Hall, Dr. Hayden, and Drs. Shumard and Newberry, on the disputed geological age and order of succession of the strata in the West, I must once more try to disentangle the thread that my learned adversaries endeavor to keep in a constant imbroglio, and state again what I candidly suppose to be the truth, taking for a basis my own observations.

In the *First Report of the Progress of the Geological and Agricultural Survey of Texas*, December 1, 1859, Dr. B. Shumard says: "Mr. Marcou, in his *Carte Géologique des Etats Unis*, has attempted to define the limits of our coal measures. But the boundaries laid down by him are incorrect, and liable to lead to serious error. The coal measures do not extend into Grayson, Fannin, Collin, and Dallas counties, as represented in that map."

If Dr. Shumard will reduce a map of Texas, containing the county boundaries, to the very small scale of my *Carte Géologique des Etats Unis*, he will see that I have not placed any coal measures in Grayson and Fannin counties, and it is doubtful if I have put any into Collin and Dallas counties, for one or two lines will easily take out a county on such a reduced scale. On such a map, colors can only give a general idea of the distribution of the principal groups of the sedimentary and crystalline rocks. Geological landmarks must be looked for there, and not the geological details of the counties. In my first geological map of the United States, published in Boston, 1853, I showed the union of the coal fields of Missouri and Iowa with that of Arkansas, which Mr. James Hall said, in the *Silliman's Journal* of March, 1854, was "without authority," p. 205, vol. XVII. It is true that Mr. Hall himself united these coal fields in 1857, in his *Geological Map of the Country west of the Mississippi*, and Mr. H. D. Rogers did the same in 1856, both of them copying me, and I suppose sustained by good authority.

During my exploration of Arkansas and the Choctaw and Chickasaw countries in 1853, I perceived that the coal measures must extend into Texas; and from the collections of Capt. Pope, submitted to me at Boston in 1854, on his line of exploration from Preston to El Paso, by Fort Belknap, I concluded that the coal field did not stop in Arkansas, but extended into Texas as far as the Clear Fork of the Rio Brazos west of Fort Belknap. Aided by the observations of Dr. Roemer on the Rio San Saba, published by that learned geologist in

1849, I extended the coal field from Iowa to the vicinity of the Rio San Saba, expressing that opinion which I continue to think a true one, by a general outline, without any claim to the exact correctness of the boundary line, except near the thirty-fifth parallel of latitude, where I have seen the exact limits. From the collections submitted to me, I judged that the cretaceous rocks overlie and even conceal from view the carboniferous rocks on both sides of the Red River, near Preston, as shown on my map; and if my limit is too far south by one line or a fraction of a line, bringing the carboniferous into Collins and Dallas counties, I am much obliged to Dr. Shumard for correcting my mistake, but cannot see that my approximative limit is *liable to lead to serious errors*, as he thinks, on this account. A glance at the *Geognostische Karte von Texas*, published in 1849, — the only one then in existence, — in comparison with my map, will show the difficulties to be surmounted, in the modification and enlargement, made by me, especially as I had only been in the northern corner of the State, near the River Canadian, a hundred miles distant from Red River, and was obliged to make out the Triassic and Jurassic age of rocks, then and at this time considered as cretaceous by Messrs. Shumard, Meek, and Hall.

The second memoir of Dr. B. F. Shumard, alluded to at the commencement of this note, is entitled *Observations upon the Cretaceous Strata of Texas.* (See *Trans. of the Acad. of Science of St. Louis*, vol. I. p. 582. 1860.)

In this memoir Dr. Shumard describes a theoretical section, showing the order of succession of the different subdivisions of the Texan Cretaceous System, so far as his observations go, and correct in the main, he believes, although he admits that "further researches may render some slight modifications necessary." The various groups of strata, in regard to their statigraphical relations and fossils, were "investigated very carefully," he says, and adds, "We have devoted special attention to the *inferior division* of the system." Yet in the description of the *lower cretaceous*, he admits that he is indebted to his brother, Dr. G. G. Shumard, for a knowledge of it, and in the description of its different subdivisions, he seldom gives the strata which overlie or underlie them.

The tabular view of the strata given by Dr. Shumard is here given: —

Section of the Cretaceous Strata in Texas. By Dr. B. F. Shumard.

		FEET.	CHARACTERISTIC FOSSILS.
UPPER CRETACEOUS.	Caprina Limestone,	60	Caprina, Cytherea, and Ammonites.
	Comanche Peak group.	300 to 400	Exogyra Texana, Gryphœa Pitcheri, Janira occidentalis, Cardium multistriatum, C. Texanum, Pholadomya Sancti-Sabæ, Lima Wacoensis, Ammonites acuticarinatus, A. Pedernalis, Scolaria Texana, Phasianella tumida, Nerinea acus, Toxaster Texanus, Holectypus planatus, Cyphosoma Texana, and Diadema Texana.
	Austin Limestone. (Fish-bed.)	100 to 120	Gryphœa vesicularis, Exogyra costata, Ostrea anomiæformis, Radiolites Austinensis, Nautilus DeKayi ?, Baculites anceps, Hemiaster perastatus. Lamna Texana, Corax heterodon (falcatus), Mosasaurus.
	Indurated blue Marl, or Exogyra arietina Marl.	60	Exogyra arietina, Gryphœa Pitcheri, Janira Texana, Dentalia.
	Washita Limestone.	100 to 120	Gryphœa Pitcheri (*common var. and var. G. Tucumcarii*), G. sinuata, Marcou (*not Sowerby*), Ostrea subovata (*O. Marshii, Marcou*), O. carinata, Janira Texana, Inoceramus problematicus, Ammonites Texanus, A. Brazoensis, Hamites Fremonti, Nautilus Texanus, Holaster simplex, Toxaster elegans.
	Blue Marl.	50	Inoceramus problematicus, Ostrea, Plicatula, scales and teeth of fishes.
	Caprotina Limestone.	55	Orbitolina Texana, Panopœa Newberryi, Cardium Brazoense, Arca Proutana, Phasaniella perovata, Nerinea, and Caprotina Texana.
LOWER CRETACEOUS.	Arenaceous group. (Fish-bed.)	80	Ostrea congesta, O. bellarugosa, Lucina, Plicatula. Lamna Texana, L. compressa, Ptychodus mammilaris, Galeocerdo pristodontus.
	Marly clay, or Red River group.	150	Ammonites Swallovii, A. Meekianus, Ancyloceras annulatus, Scaphites vermiculus, Baculites gracilis, Cytherea Lamarensis, Nucula Haydeni, Corbula Graysonensis, Inoceramus capulus.

I hope Dr. Shumard will pardon me for disagreeing with his views; and I recognize with pleasure, with Mr. Meek, that his exploration in Texas makes his memoir an important one, "entitled to great weight." He gives freely his opinion on my Pyramid Mount section, and I trust he will allow me the same liberty with regard to his theoretical section.

The *Caprina limestone* is intimately united to the *Comanche Peak group*, forming generally the highest elevation on the table-land of Texas. Directly below, is what Dr. Shumard calls the *Comanche Peak group*. Comanche Peak is a celebrated landmark in Johnston County, and as the author has given this name to a special group of rocks, it would have been desirable to have a section of it, but Dr. Shumard gives a section of Shovel Mountain, in Burnet County, fifty miles distant. The Shovel Mountain section is divided into seventeen numbers, comprising three slopes, that is to say, three portions of the mountain where the strata are concealed from view. The *Exogyra Texana* is found near the summit, and the *Gryphœa Pitcheri* near the base; the whole thickness of the section is 355 feet. The list of fossils is given without regard to the subdivisions of the strata, and no one of these fossils indicates the upper portion of the Upper Cretaceous, either in America or Europe. Some of them, such as *Gryphœa Pitcheri*, *Ammonites Peruvianus* (*acuto carinatus*), *Am. Pedernalis*, *Nerinea acus*, and *Toxaster Texanus*, are forms indicating the Neocomian group of Europe, and I should not be surprised if these forms were all found together at Shovel Mountain in the same subdivision at the base of the section, and not near the summit. The other fossils, *Exogyra Texana* (*flabellata*), *Pholadomya Sancti-Sabœ*, *Lima Wacoensis*, *Arcopagia Texana*, *Triginonia crenulata*, *Avellana Texana*, *Cerithium Bosquense*, *Holectypus planatus*, indicate forms of the upper green sand of England, and are found, I suppose, near the summit of Shovel Mountain.

Dr. Shumard gives no reason, stratigraphical or paleontological, for putting the *Caprina limestone* and the *Comanche Peak group* at the summit of the series of cretaceous rocks of Texas, except that he says, the *Caprina limestone* always caps the highest elevations of the table-lands of Texas. This greater elevation does not make it, as a matter of course, a more recent formation, and the contrary is often the case all over the world. Roemer, who considers the cretaceous strata of Texas table-lands as an equivalent of the Upper Chalk of Europe, admits that the strata of the plateaux are *older* than those of the Texas plains, such as the *Austin limestone*.

From the imperfect section of Shovel Mountain, and the list of fossils given by Dr. Shumard of *Comanche Peak group*, I consider that group as of the age of the Green sand, and to be placed below the *Austin limestone*, and the cretaceous rocks of New Jersey; and more, I think it is not rigorously limited, including in the middle and at the base strata, which are probably equivalents of what Dr. Shumard calls *Indurated blue marl*, and the upper portion or even perhaps the whole of his *Washita limestone*.

The *Austin limestone* contains fossils such as *Gryphœa vesicularis*, *Radiolites Austinensis*, *Nautilus DeKayi?*, *Baculites anceps*, *Hemiaster perastatus*, *Corax heterodon*, *Lamna Texana*, which indicate a fauna of the chalk group as well in Europe as America. I regard that subdivision of Dr. Shumard as the youngest of all the cretaceous strata of Texas as yet described; and of the age of the white chalk or *Sénonien* of France.

The *indurated blue marl* or *Exogyra arietina marl*, which comes next in Dr. Shumard's theoretical section, contains the *Exogyra arietina* in profusion, and also the *Gryphœa Pitcheri.* The author says "that it is well exposed towards the base of Mount Bonnell, near Austin." Mount Bonnell is also cited as a typical locality for his *Comanche Peak group;* by giving a section of that mountain, Dr. Shumard would have shown the *Austin limestone* placed according to his views, but none is given. Dr. George G. Shumard found this *indurated blue marl* resting upon the *Washita limestone* in the State of Arkansas, and as the *Washita limestone* is another of the subdivisions not defined with sufficient exactness to serve as a term of comparison, I am inclined to consider the *indurated blue marl* as a subdivision in the middle of the *Comanche Peak group*, and above or even included perhaps in what Dr. Shumard terms the *Washita limestone.*

The *Washita limestone* constitutes according to the author, an important member of the Texan cretaceous system; its name is taken from Fort Washita, where Dr. George G. Shumard found it finely developed. The first *desiderata* are, a good description, bed by bed, of all the cretaceous strata of Fort Washita, with the distribution of the fossils contained in them. This want is not supplied by the memoir of Dr. Shumard; the fossils are given in bulk, although it is more than probable that in those 120 feet thickness of strata, there is a regularity and order in the distribution and relative position of the fossils; they cannot all range from the bottom to the top. It is clear, from the list of fossils, that the greater part of the *Washita limestone* belongs to the lower cretaceous rocks of America, and is on a parallel with the *Néocomien* of the Jura. Without a good drawing of the *Inoceramus problematicus*, and even without a description of the fossil, so called by Dr. Shumard, I may be permitted to doubt its existence; and, if it is found at Fort Washita, it must be in the upper part of the strata, and not in the same bed with *Gryphœa Pitcheri.*

The *blue marl* with *Inoceramus problematicus* was examined by Dr. G. G. Shumard, in Grayson County, and it is given in the theoretical section without saying what strata overlie or underlie it. From the presence of the *Inoc. problematicus* in it, and of fish scales and teeth, I regard it as younger than the *Washita limestone* and place it below the *Austin limestone.*

The *Caprotina limestone* is the lowest member of the cretaceous strata of Texas. I have seen it on the False Washita, near the Canadian, resting unconformably on the Trias, and passing by almost insensible gradations to the *Gryphœa Pitcheri limestone.* The list of fossils given by Dr. Shumard indicates a Néocomien fauna. As Dr. Shumard cites the foot of Mount Bonnell as one of the typical localities for the *Caprotina limestone,* it is to be regretted, once more, that he did not give an exact real section of that mountain.

Without giving a single locality where the *Caprotina limestone* may be seen clearly and unquestionably overlying the *Arenaceous group,* Dr. Shumard makes a great division which he calls *Lower Cretaceous,* and which, according to his brother, contains, in its upper part, *Ostrea congesta, Ptychodus mammilaris, Lamna compressa, Lamna Texana,* and *Galeocerdo cristodontus.* I found the *Ostrea congesta* at Galistéo (New Mexico), in company with *Inoceceramus problematicus, Ptychodus Whipplei,* and a large Ammonite, and I have referred those strata to the Chalk group of Europe. From the fossil fishes determined by Dr. Leidy, I consider the *Arenaceous group* of Dr. Shumard younger than the *Washita and Comanche Peak group,* and of the same age with the fish-bed at the base of the *Austin limestone* and the *Blue marl* of Grayson County. The *Lamna Texana* is, according to Dr. Shumard himself, common to the *Arenaceous group* and the fish-bed of the *Austin limestone;* and the *Ptychodus mammilaris* is a very characteristic fossil of the chalk of France, England, Belgium, Italy, and Germany; so I see no reason, paleontologic or stratigraphic, for placing that division in the Lower Cretaceous rocks.

Marly clay or Red River group. This group is an interesting addition to our knowledge of Texan cretaceous rocks. From its position below the *Arenaceous group,* and from the fauna contained in it, such as *Ammonites, Ancyloceras, Scaphites, Baculites,* &c., all new species related to the Marly Chalk species of Europe or America, I regard it as a part of the Upper Cretaceous, below the *Austin limestone* and the *blue marl with Inoc. problematicus,* but above the *Caprina limestone.* I think it fills up the gap between the deposit of the cretaceous strata of the table-lands and those of the plains of Texas.

Now, if I arrange, in a tabular form, the groups of Dr. Shumard, as I am led to consider them, we shall have the following table: —

Upper Cretaceous **or** **Sénonien.**	**Austin Limestone.**	
	Fish-bed in sandstone (*L. Texana*).	**Arenaceous group with *Ostrea congesta*.**
	Blue Marl with *Inoceramus problematicus*.	**Fish-bed, *Lamna Texana*, &c.**
Middle Cretaceous **or** **Green Sand and Turonian.**	**Marly clay, or Red River group.** **Caprina limestone.** **Comanche Peak group (superior part with *Exogyra Texana*).** ***Exogyra arietina* Marl.**	
Lower Cretaceous **or** **Aptien and Néocomien.**	**Washita limestone (comprising the inferior part of the Comanche Peak group, with *Gryphæa Pitcheri*).** **Caprotina limestone.**	
	Trias or Carboniferous.	

Dr. Benjamin Shumard in this memoir not only synchronizes all the strata of my real section of Pyramid Mount, near the Llano Estacado, with his theoretical section of Texas, and that with such a degree of certainty that he thinks it " scarcely admits of a doubt," but he also regards my *Gryphæa Tucumcarii* as identical with his *Gryphæa Pitcheri*, and my *Ostrea Marshii* with his *O. subovata* of Fort Washita. I have the greatest respect for the labors of Dr. B. Shumard, who is one of the pioneers of the geology of the Mississippi valley, and I do not doubt that he candidly believes he has given a right interpretation to my observations at Pyramid Mount. But however great may be the weight due to the opinion of such an eminent observer, especially when it concurs with that of all other explorers, collectors, and Messrs. Meek, Hall, and Newberry, I continue to believe, very candidly also, that there is not a single stratum nor a single fossil of Cretaceous age at Pyramid Mount. Dr. Shumard thinks that a closer observation than mine at Pyramid Mount, would result in the discovery of the cretaceous fossils of Grayson County, and that my *Ostrea Marshii* and *G. Tucumcarii*, identical or not with his *O. subovata* and *G. Pitcheri*, " hold a position more than two hundred feet above strata that contain well-marked cretaceous types." I can only express the wish that when Dr. Shumard goes to Pyramid Mount, he may find more fossils than I did, and if any of them are cretaceous, and *below* the *Gryphæa Tucumcarii* bed, I am ready to yield to such a proof.

The *Gryphæa Tucumcarii* is a Jurassic fossil closely allied to *G.*

dilatata, *G. cymbium*, and *G. calceolata* of Europe, which have nothing whatever in common with the *Gryphœa Pitcheri* or any other cretaceous species; a clearer Paleontological case can seldom be seen; but Messrs. James Hall, W. P. Blake, and J. M. Meek have contrived to make the matter difficult and dark, in the *Reports on the Pacific Railroad and the Mexican Boundary Commission.* I have always considered their determination of fossils as valueless, and a few words of explanation will show the degree of confidence that is to be placed in them as accurate and reliable authorities.

In vol. III. *of the Pacific Railroad Explorations*, Mr. James Hall has described and figured both fossils as varieties, the one of the other. The descriptions and figures of Mr. Hall certainly do not indicate a single species with varieties, but two distinct species, as broadly distinct as two species of the same genus can be; besides, he refers all the specimens of Pyramid Mount to what he calls the typical form of a *small individual* of Dr. Morton's *Gryphœa Pitcheri*, while his *G. Pitcheri*, var. *navia*, are all from the False Washita, both varieties not being found in the same locality, but at two hundred miles distance from each other. This simple fact of stratigraphical position and distribution is a strong objection to the identification of the two fossils. Plate I., fig. 1–6, represents the *Gryphœa Pitcheri* of Hall (not Morton or Roemer). Compared with the text the figures do not give half the characters, and all the principal ones are wanting; such as being "distinctly lobed," "beak strongly incurved," "umbo large and prominent," "postero-ventral margin sinuate and elevated in a line corresponding to the depression in the opposite valve," "impressed radiating lines near the centre;" in fact, I do not recognize a single one of the figures, drawn by Mr. Meek, as representing any specimens picked up by me at Pyramid Mount, and if any of them came from there they are rolled and worn-out specimens, probably picked up on the banks of Tucumcari Creek by some other members of our expedition. Figures 7, 8, 9, and 10, on the same plate, are intended to represent the *Gryphœa Pitcheri*, var. *navia*. Mr. Hall says in the description, "upper valve unknown," when figure 8 gives a complete specimen with upper and lower valves; figure 9, is also an upper valve of another specimen well preserved. So the text is in complete disagreement with the figures. Further, those figures 7, 8, 9, and 10, have been copied from my plate published in May, 1855, in the *Bulletin de la Soc. Géol. de France*, vol. XII. pl. XXI., and the copy was so carelessly made by Messrs. Hall, Blake, and Meek, that they have put the figure 10 as the side view of the upper valve of figure 9, when in fact it is the side view of the upper valve of *Gryphœa Tucumcarii*, figured under the number 1 *a* and 1 *b* on my plate, a specimen which has nothing to do whatever with the False Washita specimens, even taking for granted the opinion of

Mr. Hall, that it is *G. Pitcheri*, var. *navia*. These examples will suffice to show the accuracy of the *Paleontology* of vol. III. of the *Pacific Railroad Exploration.*

We will now pass to the first volume of the *United States and Mexican Boundary Survey*. In the chapter by T. A. Conrad, *Descriptions of Cretaceous and Tertiary Fossils*, page 141, this learned paleontologist describes, at page 155, the *Gryphœa Pitcheri*, plate VII., figure 3, and plate X, figure 2. In the synonymy, he gives *Gryphœa Pitcheri*, Morton, which is right, for it is the species which he figures under the number 3 *a*, 3 *b*, representing, as Morton does, a young individual of the species.* Conrad gives also as synonym my *Gryphœa dilatata* var. *Tucumcarii* such as is represented in figure 3, or elongated variety, in the *Bulletin de la Soc. Géol. de France.* This is a mistake, and he corrects it in a letter, which I will give a few lines further on. I agree entirely with Mr. Conrad, in his description of specimens figured. Plate VII., figure 3 *a*, 3 *b*, represents a young individual, and figure 3 *c*, 3 *d*, is a full-grown but broken specimen, representing the common form of the *Gryphœa Pitcheri;* figures 3 *g* and 3 *f*, represents the smaller valve of the *Gryphœa Pitcheri.* Plate X, figure 2 *a*, 2 *b*, represents an upper valve of the *Gryphœa Tucumcarii*, so far as I can judge of the drawings without a description, for there is none given.

It seems needless to make a var. *navia* for the young individual, merely to express a difference in age.

Mr. Dana, in his *Review of Marcou's Geology of North America*, having quoted Conrad's opinion against me, I was led to inquire more closely into the matter, as I have a great respect for that Paleontologist, and wished to discover, if possible, the reasons why such an observer should hold so different an opinion of those two *Gryphœæ* from that of Deshayes, D'Orbigny, Agassiz, Pictet, and D'Archiac.

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* I have never seen Morton's original specimen. If the figure in his *Synopsis of the Cretaceous Group of the United States*, plate XV., figure 9, is correct, it differs in its general outline and in the details of both valves, from the young specimen of *G. Tucumcarii*, published in my *Geology of North America*, plate IV., fig. 2; and as it differs even more from the young specimen of *G. Pitcheri*, figure 6, on the same plate, I am led to believe that I did not meet with the true *G. Pitcheri* of Morton, in my explorations with Captain Whipple's party. Mr. Ferdinand Roemer having the opportunity of seeing in the company of the late Dr. Morton himself, the original specimen at Philadelphia, I naturally followed his identification of *G. Pitcheri;* and if Roemer has made a mistake, I was misled by his description in *Die Kreidebildungen von Texas.* Thus we shall have three species of *Gryphœa;* 1, the *G. Tucumcarii* of the Jurassic rocks of Pyramid Mount (New Mexico); 2, the false *G. Pitcheri*, of Roemer and Marcou, or the false *G. Pitcheri* var. *navia* of Conrad and Hall, of the cretaceous rocks of the false Washita River (Texas), which may be called *G. Roemeri*, in honor of its first discoverer, Mr. F. Roemer; and 3, the true *G. Pitcheri* Morton, which I have never seen, and, consequently, on which I cannot give any information as to its stratigraphical position and association with other fossils.

On looking more closely at the plates of the *Mexican Boundary Report*, I found on the last plate, No. XXI., figure 3 *a*, 3 *b*, 3 *c*, a specimen of *Gryphœa Tucumcarii* under the false name of *Gryphœa Pitcheri*. Mr. Conrad, in his description of *Gryphœa Pitcheri*, p. 155, makes no reference whatever to that plate, nor to the figures 3 *a*, 3 *b*, 3 *c;* and in the *Explanation of Plates of Prof. Hall's Report*, p. 174, nothing is said of the locality or the stratigraphical position of this fossil. The plate was drawn by Mr. F. B. Meek, who has put it under the head of *Cretaceous*. The mysterious appearance of this beautiful fossil is rendered still more suspicious from the fact that, at p. 144, reference is made to plate XXI., in order to bring in the supposed *Gryphœa Pitcheri*, figured upon it, as a proof of the cretaceous age of the formation; and Mr. Agassiz is made (in a foot-note) to sustain this opinion, although it is well known that he has considered these two fossils as distinct, from the beginning.

For any reader not deeply interested in the matter, that page 144 of the *Description of Cretaceous and Tertiary fossils* by Conrad, will seem to be written by Conrad himself; when in fact Mr. Conrad had nothing to do with it, and in order to find the writer we must look at the foot of page 103 of *Geology and Paleontology*, by Mr. J. Hall, where, in a foot-note, he says that he has described the "Echinodermata at the request of Mr. Conrad, putting them in their proper place," without saying if it is also at the request of Mr. Conrad that, in describing his Echinodermata, he figured in plate XXI. a *Gryphœa Tucumcarii* under the false name of *G. Pitcheri*. Desirous to know the opinion of Mr. Conrad himself on these incomprehensible and doubtful proceedings, I wrote to him, and give below his answer: —

PHILADELPHIA, *January* 25, 1861.

JULES MARCOU, ESQ.:

Dear Sir: — . . . . . When I drew up the Report in Emory's Survey, I was shown by Professor Hall a series of *Gryphœa*, some of which were undoubtedly your *G. Tucumcarii*, as figured on plate XXI. Professor Hall thought they graduated into *G. Pitcheri*, and I thought so at the time. The name of your species ought not to have been placed as a synonym to plate VII., figure 3, for it is undoubtedly *G. Pitcheri*.

But the figures on plate XXI. represents a species and specimen, the locality of which is *unknown* to me, and were engraved *after* I had sent in my report and descriptions. So that I can now say, that I do not know whether *G. Pitcheri* is identical with your species or not.

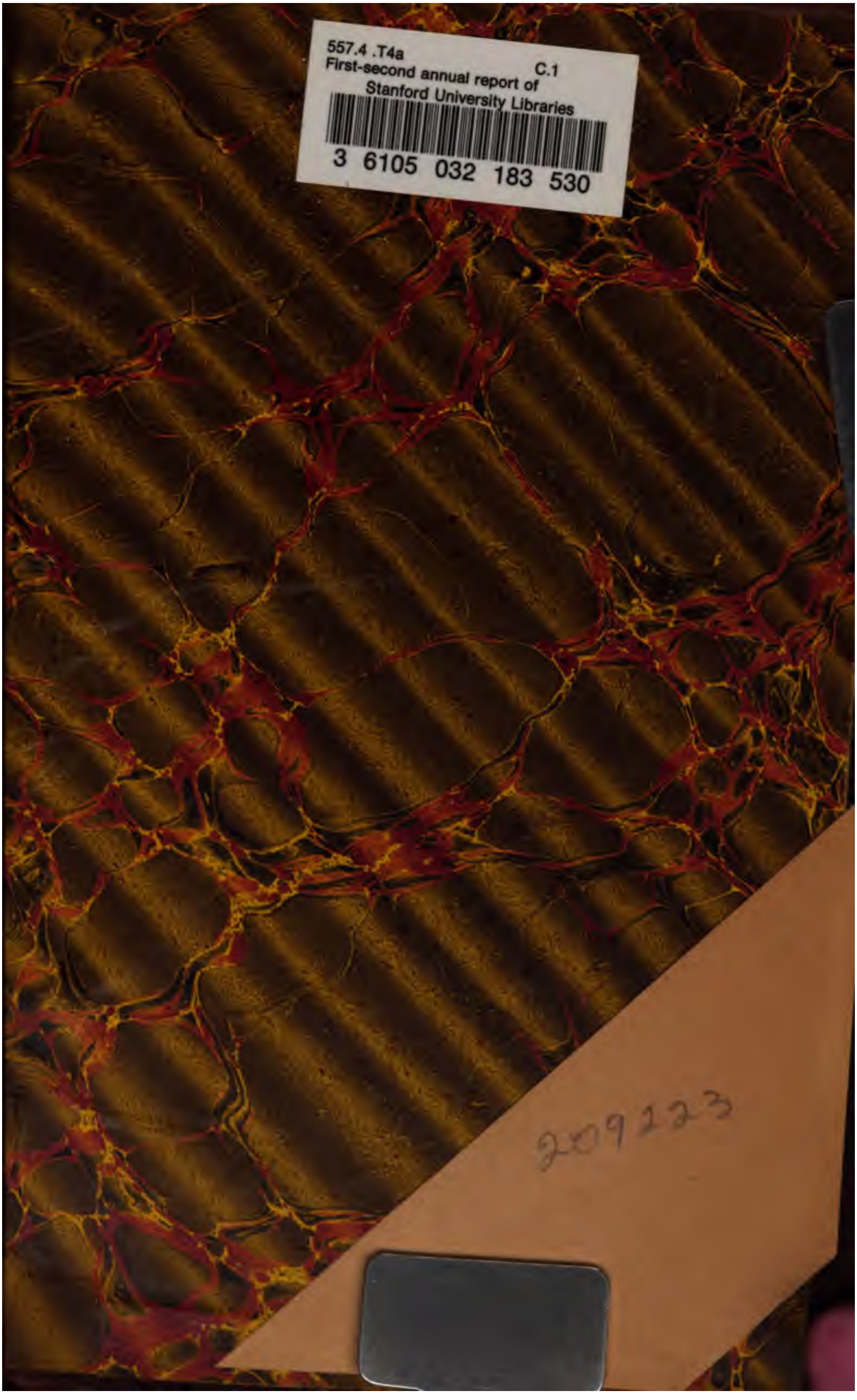
The localities of the *G. Pitcheri* (page 155, Lèon Spring, Texas; plains of Kiamesha, Arkansas; New Braunfels, Texas; Fort Washita and Cross Timbers, Texas), are correctly given, from MSS. accompanying the specimens.

. . . . . sincerely yours, T. A. CONRAD.

That the *G. Tucumcarii* is found at Lèon Spring, is a fact first made known in my Report of 1854, from a specimen picked up there by Dr. Kennerly, and it is also certain that cretaceous fossils have also been found there by Col. Emory; but it is not necessary to place the *G. Tucumcarii* in the same bed with the cretaceous fossils, for the Jurassic and cretaceous rocks may well exist together in that locality. I have always believed that the cretaceous strata would be found *overlying* the Jurassic rocks on the plateau between Rio Pecos and the Rio Grande, on the road to El Paso, and I have no doubt that a practical geologist will one day give a detailed section, showing such an arrangement of the strata in the vicinity of Lèon Spring.

I have taken pains to have a very good plate of the *G. Tucumcarii*, *G. Pitcheri*, and *O. Marshii*, drawn in Paris by the best artist there for fossils, M. Humbert; that plate is not only in the *Bulletin de la Soc. Géol. de France*, vol. XII., but also in my *Geology of North America*, with descriptions of the three species. I have placed specimens in a good state of preservation in the following collections: Museum des Naturalistes de Moscow; Museum at Berlin by Humboldt himself and Mr. Mulhausen; at the Museum of the Universities of Munich, Basle; at the Royal Museum at Stuttgart; at the École Polytechnique of Zurich; at Pictet's collection at Geneva; D'Archiac's collection; at the Jardin des Plantes, and the École des Mines, at Paris; at the Geological Society of London (where are the specimens figured on the plate); and finally, at the Museum of Comparative Zoölogy of Mr. Agassiz, at Cambridge, Mass. So it will be always easy to see what I mean by *G. Tucumcarii* and *G. Pitcheri*, notwithstanding the Hall, Blake, and Meek imbroglio.

In conclusion, if Dr. B. Shumard continues to hold the opinion that he finds my *G. Tucumcarii* and *Ostrea Marshii* at Fort Washita, with cretaceous fossils, I hope he will be induced to give a good drawing of them, with detailed descriptions, and a real section of the strata at Fort Washita, like my detailed section of Pyramid Mount, in order to allow geologists to judge for themselves *avec connaissance de cause;* but as long as he contents himself with simple affirmation, and theoretical sections, his views will have no more weight than a mere contradiction of mine, without proofs to sustain them.



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